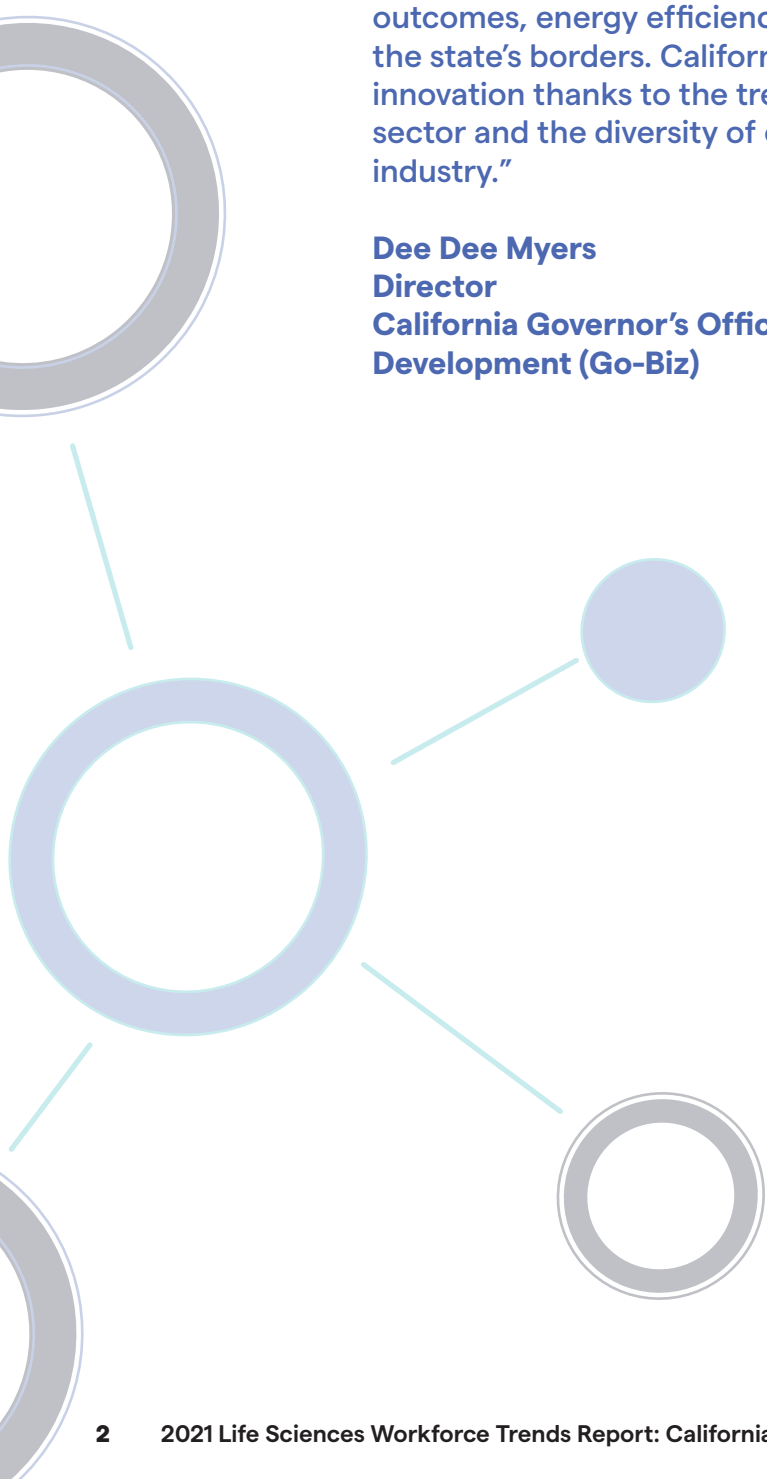


2021 Life Sciences Workforce Trends Report

California





“The life sciences are a cornerstone of technological innovation in California. Local firms, laboratories, and universities perform cutting-edge research and development (R&D) activities that have led to numerous technological breakthroughs and generated commercial products with significant positive impacts on health outcomes, energy efficiency, and economic well-being far beyond the state’s borders. California is a global leader in life sciences innovation thanks to the tremendous workforce that drives the sector and the diversity of opportunities provided by this vibrant industry.”

Dee Dee Myers
Director
California Governor’s Office of Business and Economic Development (Go-Biz)

REPORT

Life Sciences
Workforce Trends

2021

CA

2020 will forever be remembered as a year that shook the world, a year in which the global economy stalled and contracted, and a few harrowing minutes – followed by successive months of senseless killings - galvanized the public around the need to confront systemic racism and exclusion. The California life sciences industry was not immune to these disruptions, quickly “seizing the moment” and adapting and pivoting to confront the global pandemic by developing tests, treatments and vaccines for the coronavirus. At the same time, and with new urgency, the industry stepped forward to re-examine and address complex and deep-seated exclusionary practices. What did this mean for the people needed to drive and be a part of this transformation? Agility, commitment, adaptability, passion, innovation, experimentation - many of the qualities that have positioned this industry as a key leader of economic and workforce growth for decades - and, in 2021, change.

Year after year, the industry has demonstrated its ability to adapt and forge ahead to address an array of persistent and emerging global challenges. California – notable for its world-class academic research institutions, capital influx, and “Wild West” culture - has been fortunate to churn out and attract top-notch talent. It also hosts a robust and growing pool of biotechnician-level talent that is racing to meet current industry demand.

While the years ahead promise continued innovation, adaptation and, with this, new economic and career opportunities, there are continued and emerging threats to meeting the industry’s talent needs. California will need to confront these challenges head on in order to continue as the vanguard of global innovation in the life sciences.

The COVID pandemic led to a pause in the biennial (2020) production of this report. This delay, however, has offered a critical perspective and future vision for the California industry’s talent needs in the post-pandemic era.



Since the launch of the modern biotech era in 1978, California’s life sciences industry has evolved into a major driver of innovation, economic development and job creation for the state. Today this industry spans sectors as diverse as drugs & pharmaceuticals, diagnostics, medical devices and tools, vaccines, industrial and synthetic applications, agriculture products and nutraceuticals, with major employers in each of these sectors (Figure 1).

Who in California’s Life Sciences Industry is Hiring?

Top 15 Companies by Unique Job Posting Totals (2017-2020), in Descending Order

- | | | | |
|----|------------------------------|-----|-----------------------------------|
| 1. | Thermo Fisher Scientific Inc | 9. | Quest Diagnostics Incorporated |
| 2. | Amgen Inc. | 10. | Johnson & Johnson |
| 3. | Abbott Laboratories | 11. | Edwards Lifesciences Corporation |
| 4. | Danaher Corporation | 12. | IQVIA |
| 5. | Medtronic, Inc. | 13. | Illumina, Inc. |
| 6. | Gilead Sciences, Inc. | 14. | Laboratory Corporation of America |
| 7. | Genentech, Inc. | 15. | Pfizer |
| 8. | Roche Laboratories Inc. | | |

Figure 1: Source: Analysis of Emsi, JPA Database, Q1 2021.

Defining the Life Sciences Industry

TEconomy’s principals have worked closely in partnership with the Biotechnology Innovation Organization (BIO) for nearly two decades on biennial bioscience/life sciences industry reports on the state of the industry. These efforts have yielded a generally accepted definition of the life sciences industry that is used for this report. That definition comprises these five major industry subsectors, as specified by federal NAICS industrial classifications detailed in Appendix B:



At its essence, the life sciences industry embodies disruptive discoveries that fuel healthier lives and market transformations. California enjoys a unique interplay of academic excellence, scientific discovery and technological innovation, together driving a vast and expanding array of transformative breakthroughs that are addressing some of the globe's most pressing challenges. This continues to open novel discovery pathways and opportunities for company creation, while igniting an array of new career possibilities.

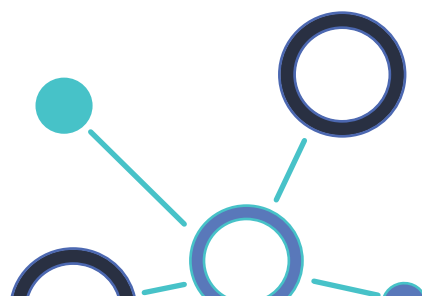
In spite of the challenges of 2020, California witnessed a new wave of rapid industry innovation in research, supply chain management, business processes, and people management. Informing key stakeholders of the industry's current and anticipated demand for talent needed to continue driving this discovery and growth is a key objective of this report. The report also highlights some of the global and infrastructure challenges California's life sciences leaders face - including the immediate and lasting impacts of the COVID pandemic - in building, attracting and sustaining a robust, productive workforce for the industry.

Meeting the California industry's evolving workforce needs, across all skill levels and industry sectors, however, will require dialogue and creative partnerships between industry, academia, government and community-based organizations. This report provides insights into how we can work together to develop the required pipeline of industry talent, including the partnerships and other strategies needed to identify and tap into new pools of diverse talent.

BENEFICIARIES

Multiple stakeholders play essential roles in ensuring California's life sciences industry has the talent it needs at all levels to fuel innovation, and workforce and economic growth:

- Company executives who must build organizations, develop talent and allocate resources to address unmet medical and societal needs, while leading in a competitive environment of global macroeconomic uncertainty and shifting policies
- Legislators who must set policy and allocate resources based on industry and constituent needs
- Recruiters who must match available talent with evolving company demand
- HR professionals who must increase access to broad talent pools, and develop, engage and motivate employees
- Educators and training providers who must prepare the next generation of industry talent, responding to industry input into the evolving skills needed to thrive in and advance a dynamic industry
- Community-based organizations, which provide critical support to communities and individuals by addressing opportunity/educational gaps, developing and delivering innovative STEM education programs, and providing college and career readiness training and support. They frequently work in partnership with other ecosystem stakeholders and in support of vulnerable and underrepresented populations



REPORT METHODOLOGY

This report highlights current and anticipated skills needed for life sciences industry positions in California. It draws principally from three data sets: job posting data from the last four years, and first-quarter 2021 quantitative and qualitative data provided by California's life sciences industry employers. These three data sets (i.e., Job Postings, Hiring Survey, and Interviews) are summarized below and the detailed methodology for data collection are provided in Appendix A.

Job Postings

Quantitative data from 385,203 unique postings for California life sciences jobs for the four-year period of January 2017 to December 2020, incorporating representative industry NAICS codes analyzed by TEconomy Partners using Emsi, JPA Database, Q1 2021; <https://economicmodeling.com/> ("Job Postings")

Hiring Survey

Q1 2021 survey responses from human resource representatives and hiring managers at 334 California life sciences companies. The survey focused on recent hiring, workforce composition and hiring challenges ("Hiring Survey").

Interviews

Q1 2021 interviews with executives at 23 California life sciences companies, in which industry leaders discussed their chief talent concerns ("Interviews").

Figure 2: Industry Hiring Survey & Interviews- Count of Respondents by Major Life Sciences Industry Subsector

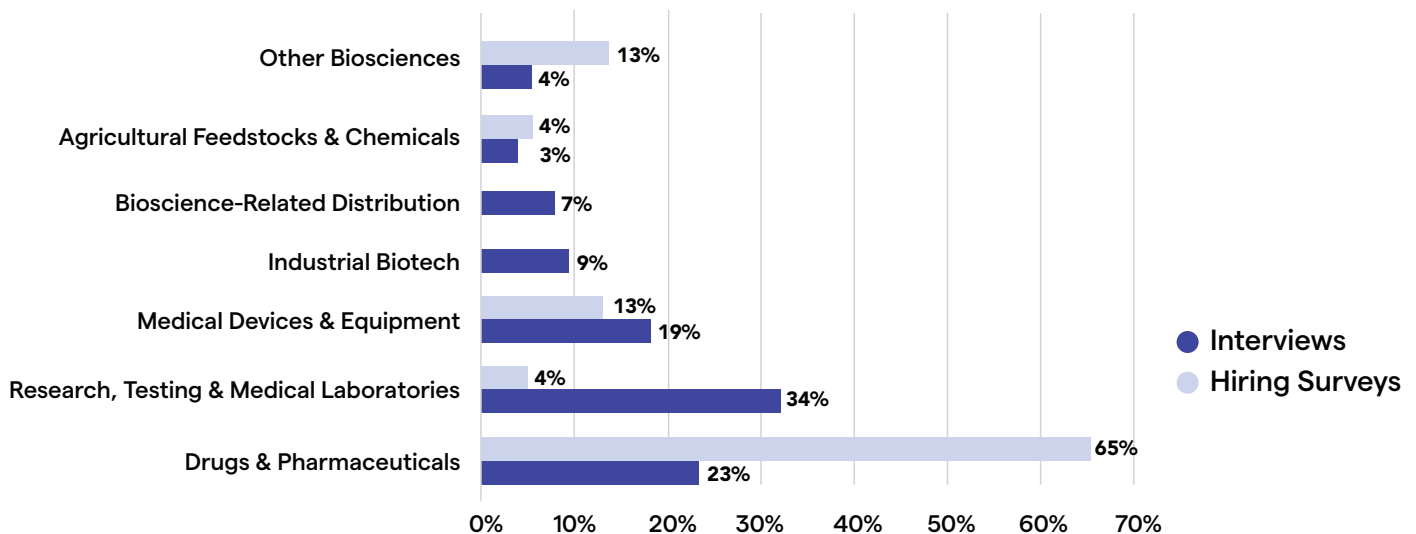


Figure 2: Industry sector distribution of companies participating in this 2021 survey of California's life sciences industry and its workforce needs. Industry executives from 23 companies were interviewed ("Interviews"). 334 companies responded to an online survey ("Hiring Survey").

TRENDS IMPACTING TALENT NEEDS

5 key trends emerged from our data sets that are impacting the California industry's demand for talent:

1

California's Life Sciences Industry remains resilient, demonstrating stability and growth amidst a global pandemic

2

COVID-19 changed the way we think about work and the workplace: companies evaluate remote work and other workforce management innovations

3

"Soft skills" are increasingly viewed as predictors of career success: adaptability, resilience, and communication rise to top of desired skills as we navigate uncharted economic and industry transitions

4

An array of new or amplified initiatives pushes Diversity, Equity and Inclusion (DEI) into the spotlight with broad recognition within the industry that we must and can do more

5

New energy behind industry-academic collaborations addresses shifting demands for talent

Trend 1

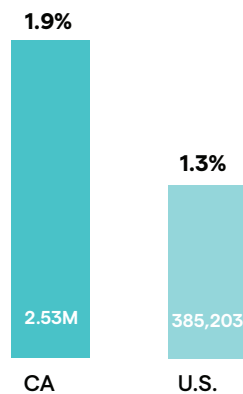
CALIFORNIA'S LIFE SCIENCES INDUSTRY REMAINS RESILIENT, DEMONSTRATING STABILITY AND GROWTH AMIDST A GLOBAL PANDEMIC

2020 was a year of radical change and disruption for California, marked by devastating wildfires across the western United States, a national reckoning with racism, a historically divisive general election, the global COVID-19 pandemic and economic turmoil, with the World Bank estimating a 4.3% contraction of global GDP and a 3.6% fall in US GDP in 2020. Throughout this confluence of extraordinary events, life sciences companies in California demonstrated remarkable resilience, quickly adapting to maintain business continuity and the safety and well-being of their employees; many swiftly pivoting to develop vaccines, tests and treatments to combat COVID-19.

Despite this turmoil, most companies remained remarkably stable during this period. Some companies expanded. In fact, the overall number of life sciences industry job postings across the state increased 20% from January 2017 to December 2020, in spite of the COVID pandemic disruption, which contributed to a 16.5% drop in the number of job postings from 2019 to 2020 (Figure 3).

Figure 3: Unique Life Sciences Industry Job Postings, Jan. 2017-Dec.2020

Life Sciences' Share of Total Unique Job Postings in California and the US, 2017-20



Trends in Total Unique Life Sciences Industry Job Postings from California Life Sciences Companies, 2017-20

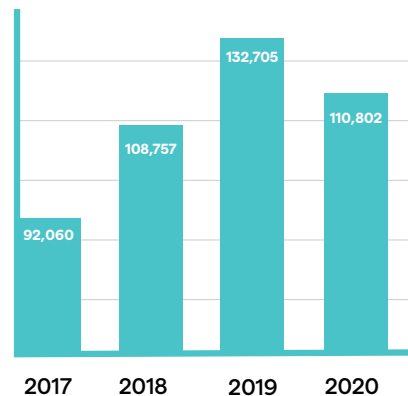
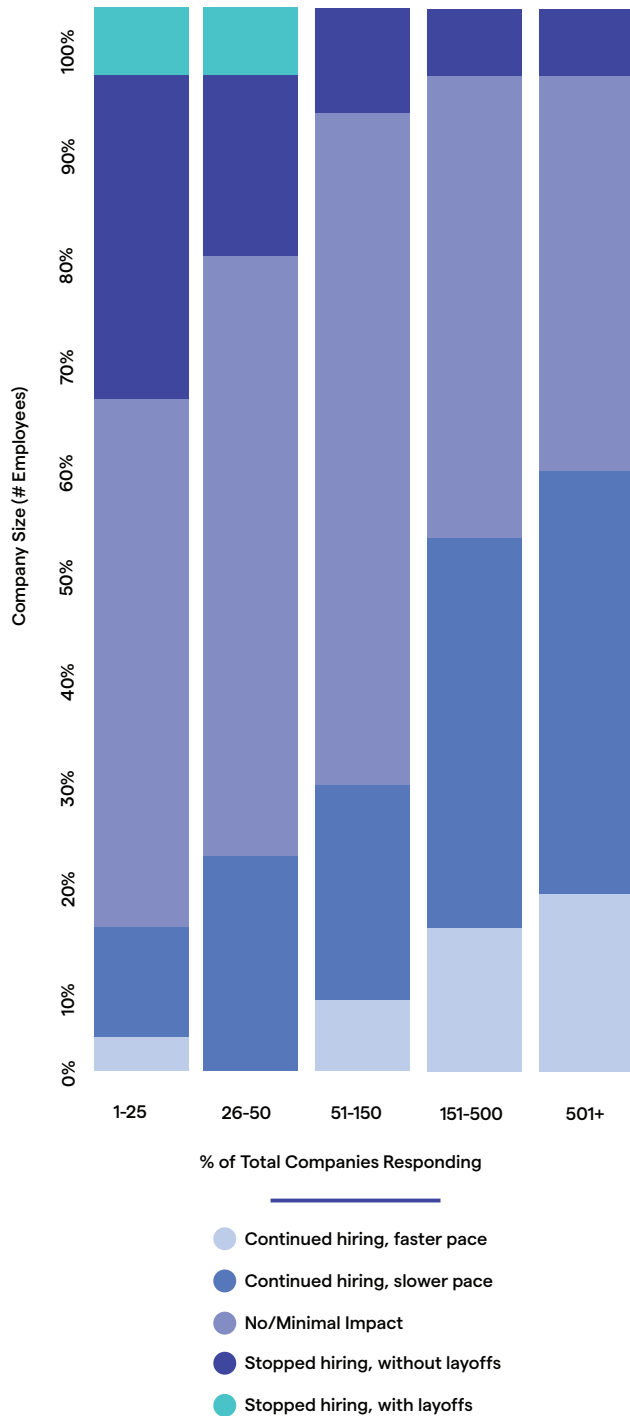


Figure 3: The individual years in trend analysis will not sum to cumulative totals due to unique postings that span across individual years. Source: TEconomy Partners' analysis of Emsi, JPA Database, Q1 2021.

“Despite the disruptions of the past year, California’s life sciences industry continues as a consistent engine of economic growth and high-quality job creation across the state and across industry subsectors.”

--Life Sciences Industry Executive

Figure 4: COVID-19 impact on Hiring by Company Size %



Of the 222 companies that provided data on their hiring over the past two years, 54% (n=177) report that the pandemic had little to no impact on their hiring, while 5% (n=17) hired at a faster pace. Larger companies were more likely to have hired staff: 54% of companies with >151 employees continued hiring; whereas only 16% of companies with <150 employees did so. There were no significant differences noted across industry sectors, nor shifts in hiring to new functions or technical areas.

None of the companies we interviewed and very few of those surveyed report pandemic-related furloughs or layoffs. While 25% (n=84) stopped hiring, only 6% (n=19) furloughed or laid off workers (Hiring Survey data). All 19 of these companies were small, none with more than 50 employees. The most significant layoffs were concentrated among companies with 25 or fewer employees.

In sum, despite the disruptions of the past year, California’s life sciences industry continues as a consistent engine of economic growth and high-quality job creation for the state and across industry subsectors, three of which account for 91% of the total Job Postings: drug and pharmaceutical (36%); medical devices and equipment (29%) and research testing and medical laboratories (26%).

Figure 4: Hiring Survey responses on the impact of the COVID-19 pandemic on hiring (n = 322). Company distribution by size class: 1-25 employees (n=192), 26-50 employees (n=45), 51-150 employees (n=37), 151-500 employees (n=31), 500+ employees (n=17)

Each of the three foundational data sets for this report paints a picture of strong, continued demand for talent across multiple functional areas and job types for California's life sciences industry. In both the Interviews and the Hiring Survey, companies described fierce competition for talent. They indicated challenges in hiring across functional areas, and challenges finding skilled individuals to fill specific roles, such as: research scientist (non-clinical) or R&D positions, computational biology/statistics, regulatory affairs/compliance, engineering and product or process development, clinical research, engineering technician, quality control/assurance, logistics/distribution, and lab technician. This aligns with those technical and production-related roles most frequently mentioned in Job Postings (Figure 5). As in prior years of the report, this year's Hiring Survey again showed that quality and regulatory affairs continue as some of the most difficult functions for companies to find talent.

Figure 5: Leading Technical and Production-Related Job Titles in Life Sciences Industry Job Postings*, 2017-20

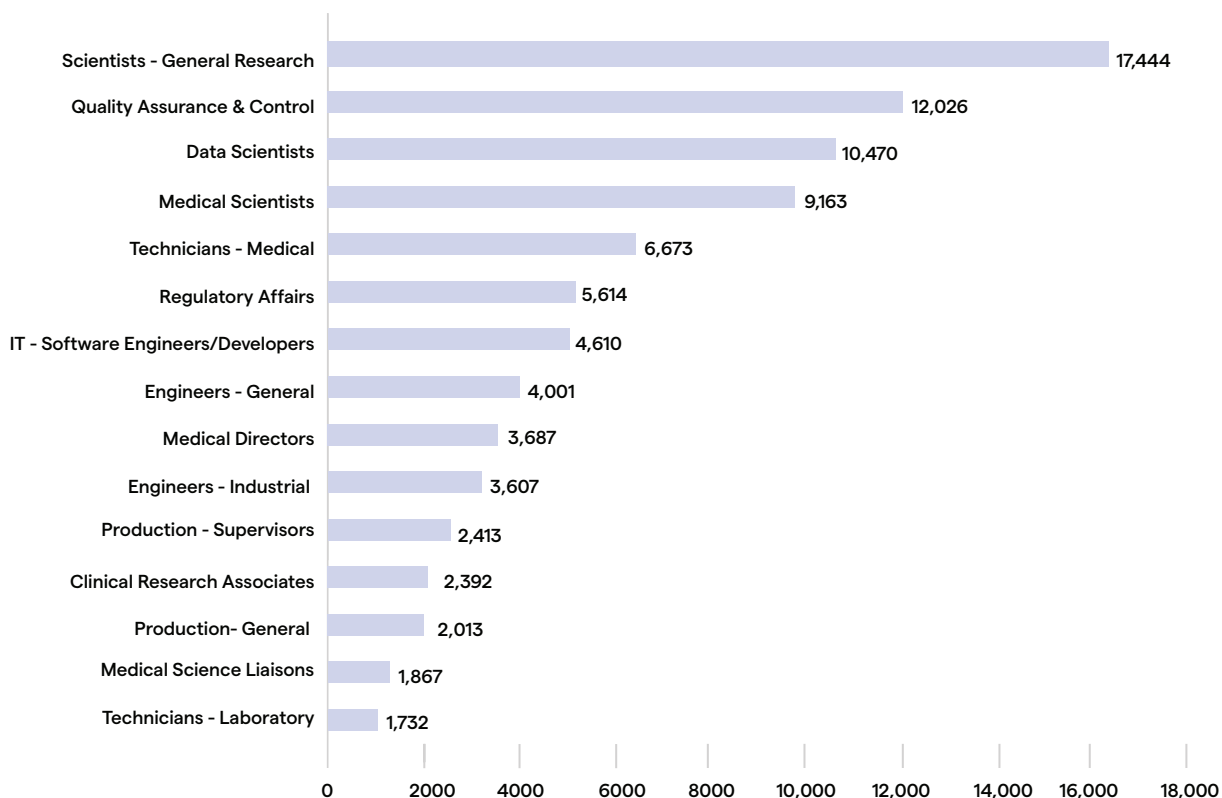


Figure 5: Major technical and production job classes by number of mentions in the unique Job Postings for California life sciences industry jobs, Jan. 2017 – Dec. 2020. Emsi limits information on job titles and corresponding numbers of postings to the top 1,000, limiting the ability to provide comprehensive totals by categories. This excludes large segments of the industry workforce in managerial, sales, and other business functions to focus on life sciences-specific positions.

Source: Analysis of Emsi, JPA Database, Q1 2021.

High demand extended beyond technical and production roles, pointing to a growing cohort of mature life sciences companies in California with new or expanding commercial operations. There are large numbers of job postings for sales & account representatives and general management professionals (data not shown), positions largely requiring hybrid expertise in technology and business. For example, many technical sales jobs require advanced degrees in science, as the roles require workers to both advise their customers and sell products/services. Similarly, many scientific or technical management roles require hybrid skills in management and science.

Deciphering Some Life Sciences Job Titles*

Job postings for **Data Scientists** have been combined to include a range of ways in which employers refer to these professionals and their expertise. Examples of leading job titles identified and grouped include Biostatisticians, Statistical Programmers, Bioinformatics Scientists, Analytics Managers, Data Scientists, and Computational Biologists.

Medical Scientists includes an array of specializations focused in varied disease and human health areas engaged in clinical investigations and R&D. Examples of leading U.S. job titles in this grouping include Pharmacologists, Immunologists, Infectious Disease Specialists, Oncologists, Neuroscientists, Toxicologists, and Diagnosticians.

Medical Technicians include a very large and leading focus on hiring Phlebotomists among both medical labs focused on diagnostic testing and biopharmaceutical companies focused in blood plasma-based products. Other examples of leading job titles include Flow Cytometry Specialists, Histotechnologists, Medical Lab Technicians, Cardiovascular Technicians, and Ophthalmology Assistants.

The industry deploys and is hiring an **Engineering** workforce with varied expertise and specialization. While the categories of “general” engineers and “industrial” engineers are among the top 15 job classes (Figure 5), demand for engineering expertise extends even more broadly, making engineering overall a sizable occupational segment. Specifically the Job Postings data shows there is strong demand for engineering that is not shown on Figure 5, including Field Service Engineers (largely hired in the medical devices subsector); Mechanical Engineers; Electrical Engineers; Product Development and Design Engineers; and Systems Engineers.



*From CSBI, 2021 Life sciences Workforce Trends Report: Taking Stock of Industry Talent Dynamics Following a Disruptive Year, prepared by TEconomy Partners, LLC pg.17.)

A REGIONAL GLANCE AT DEMAND ACROSS CALIFORNIA'S MAJOR HUBS

Demand for talent remained strong among life sciences companies in each of California's three major life sciences hubs and across its subsectors, demonstrating long-term growth overall in spite of some drop-off in job postings in 2020. Outside the three major regional hubs, the number of job postings fell 27% in 2020. This contrasts with smaller one-year contractions of 4%, 13% and 21% in San Diego County, the San Francisco Bay Area and the Los Angeles/Orange Counties areas, respectively.

Geographically, San Francisco Bay Area Job Postings led with 44% of the total life sciences industry postings for the state; 25% of the positions were in Los Angeles and Orange Counties; 14% for San Diego County. Additional detailed analysis of the Job Postings by region is provided in Appendix C.

Figure 6 : Industry Job Postings by Region and Year

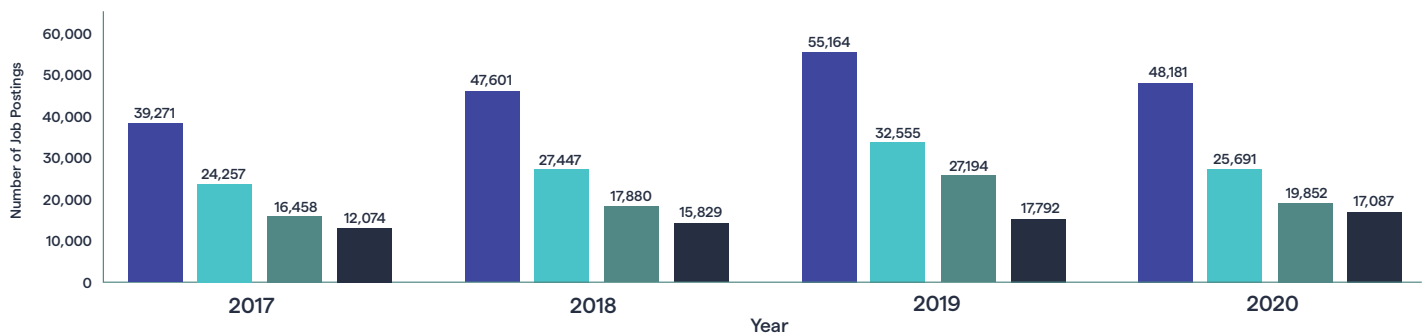


Figure 6: Geographic location of the 385,203 jobs in California Job Postings by year. The Bay Area includes 10 Northern California counties (Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Santa Cruz, Solano, and Sonoma)
Source: Analysis of Emsi, JPA Database, Q1 2021.

Figure 7a: Geographic location of the 385,203 jobs in California Job Postings from January 2017 – December 2020. The Bay Area includes 10 Northern California counties (Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Santa Cruz, Solano, and Sonoma)

Figure 7b: Industry subsectors responsible for the California life sciences industry Job Posting from January 2017 – December 2020.
Source: Analysis of Emsi, JPA Database, Q1 2021.

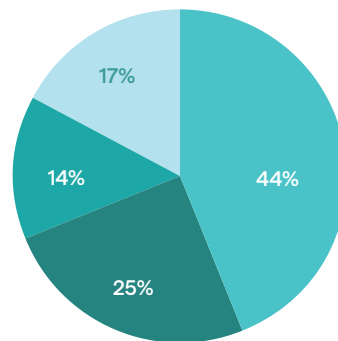


Figure 7a :
Geographic Distribution of Job Postings

- Bay Area (10 Counties)
- Los Angeles & Orange Counties
- San Diego County
- All Other CA Counties

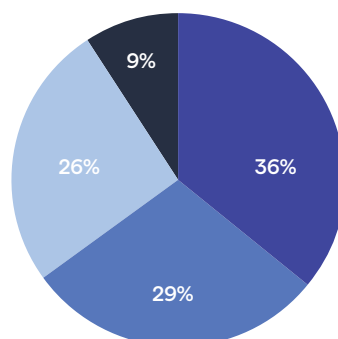


Figure 7b:
Industry Subsector Distinction of Job Postings

- Drugs and Pharmaceuticals
- Medical Devices and Equipment
- Research, Testing and Medical Labs
- Other

California's life sciences companies continued to seek both entry-level and experienced hires, creating broad opportunities for talent acquisition and individual advancement. Demand for entry-level talent is indicated by the 17% of Job Postings that required only a high school or 2-year college degree; and the 65% that required no education beyond a bachelor's degree. Just over one-third of postings (34%) specified advanced degrees. With regard to prior work experience, 28% of Job Postings specified 0-3 years' experience; 21% for 4-6 years; and 18% 7+ years. No experience was specified in 34% of listings.

Figure 8a : Educational Requirements

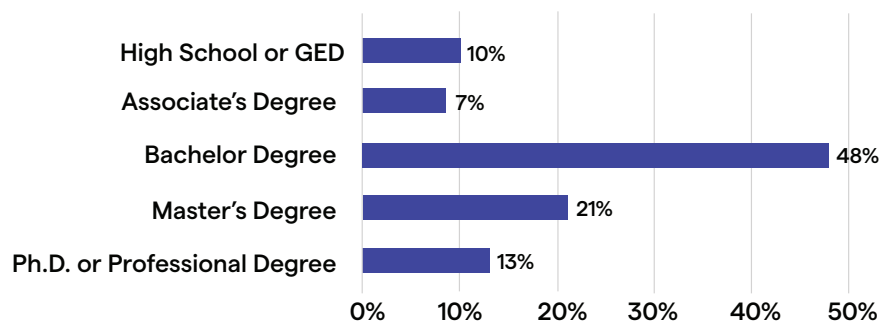
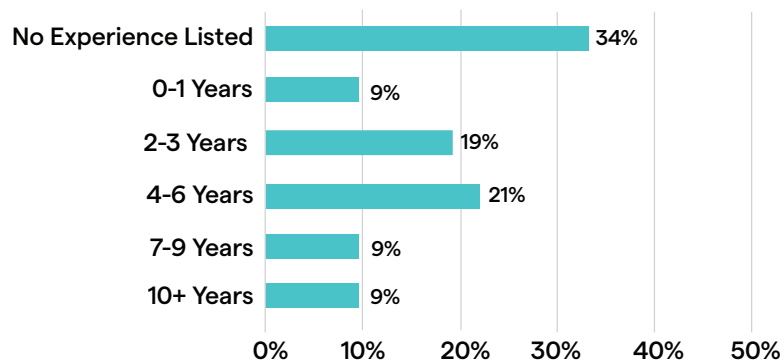


Figure 8b: Prior Work Experience Requirements



Figures 8a and 8b. Educational requirements and prior work experience requirements listed in the 385,203 California life sciences Job Postings January 2007 – December 2010. Source: Analysis of Emsi, JPA Database, Q1 2021

SOURCING ENTRY-LEVEL TALENT

Companies employ a variety of tools to source new talent. They rely on online job boards, but also staffing agencies, college/university programs and internships in identifying entry-level hires.

Figure 9: Mentions Across 3 Entry Level Positions

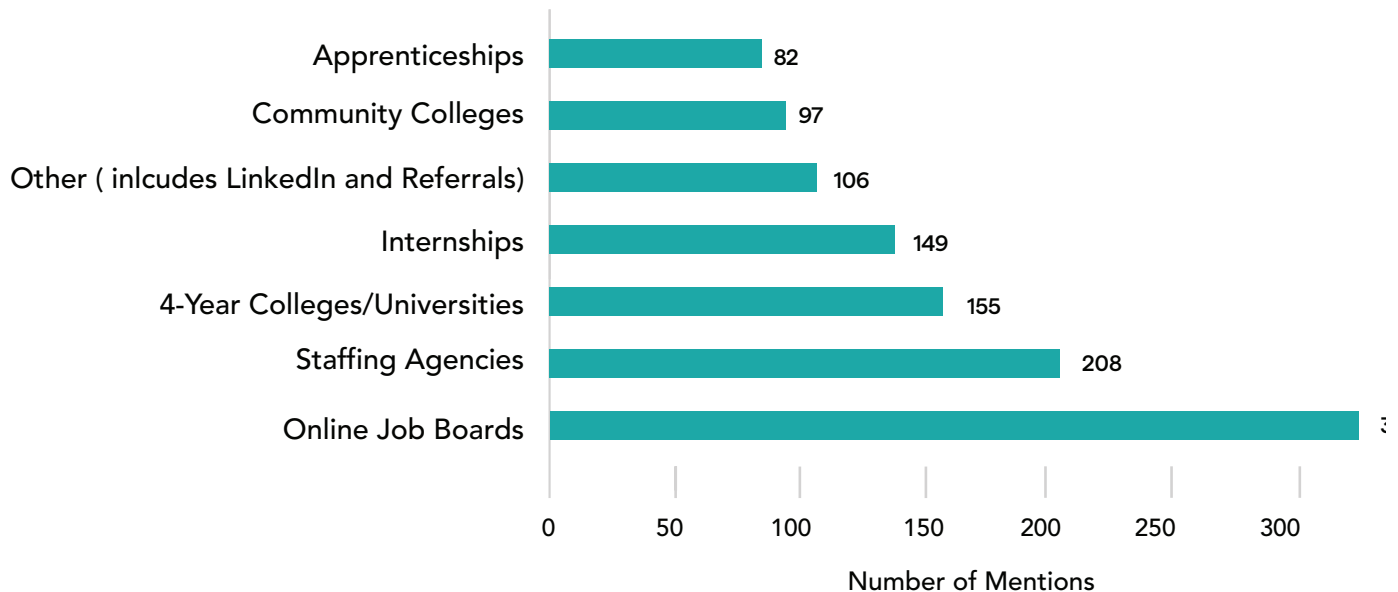


Figure 9: Most frequently used sources to identify entry-level talent. Shown are aggregate counts of the tools mentioned by 305 California life sciences company Hiring Survey respondents for identifying entry-level across three job categories (i) technicians, (ii) production workers and (iii) other entry-level jobs.

Foreign nationals historically play an important role in employers' talent mix; however we note a diminished role for H1B visas from the 2018 report and a diminished role in California relative to what was observed nationally. In 2018, the report indicated that 52% of California life sciences companies with fewer than 500 employees, and 89% of companies with greater than 500 employees employed H1B Visa Holders. This year only 20% of 334 California companies completing the Hiring Survey reported employing H1B Visa Holders. Nationally, 32% of companies reported hiring H1B visa holders and 63% of them reported it was more challenging with recent travel bans and visa restrictions.



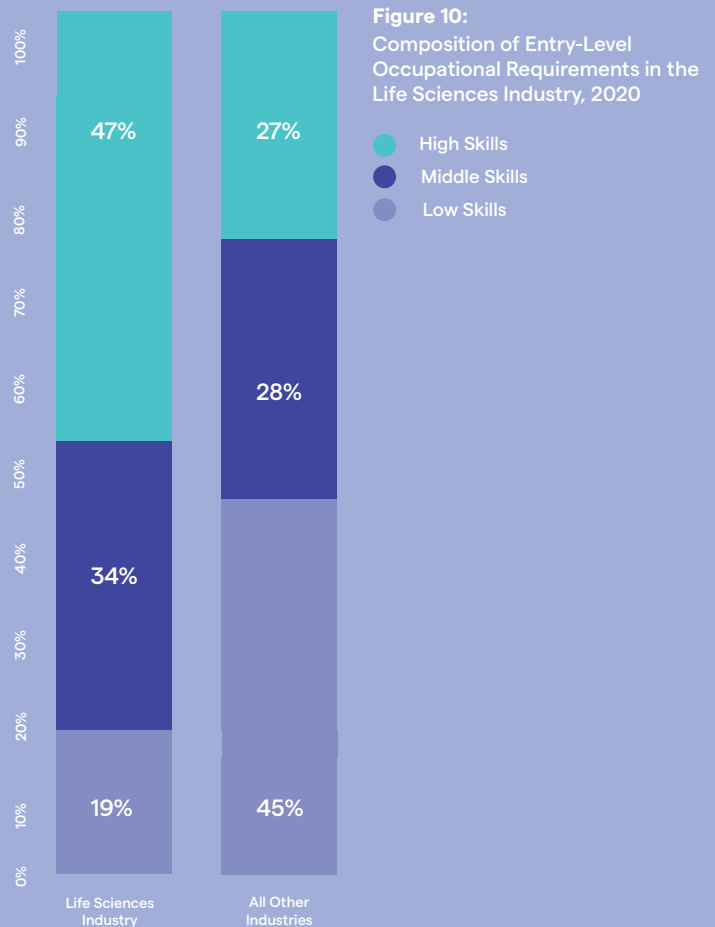
Characterizing Life Sciences Talent Demand: Job Titles and Skill Sets*

Setting the Talent Demand Context for the Life Sciences Nationally: The Skill Mix Today

The life sciences industry employs a more highly skilled, STEM-intensive workforce compared with all industries nationally reflecting its role as a leading knowledge-based, science-driven industry working toward innovative solutions to global challenges in health, energy, sustainable industrial products, and feeding the world. The industry's occupational mix, revealed in industry "staffing patterns" data, is tilted heavily toward those roles that can be considered either high-skilled or middle-skilled based on their typical entry-level requirements. High-skilled jobs typically require a bachelor's or higher degree for entry, whereas middle-skill jobs most typically require education and/or training beyond a high school diploma, but less than a bachelor's degree.

In 2020, nearly half (47%) of life sciences industry employment was in high-skilled occupations compared with 27% for all other industries (Figure 10). These include the vast majority of scientist, engineering, IT, and data sciences roles, or "STEM"-related talent, and reinforce the critical need for robust national postsecondary education degree programs to meet industry talent needs.

At the same time, about one-in-three life sciences industry jobs fall in the middle skills categories, again well above the share for all industries. As a leading advanced manufacturing industry, life sciences companies rely heavily on the skilled technician workforce, both in engineering and scientific domains; production workers with varied skills; transportation and material moving occupations; installation, maintenance and repair; and more. These workers are operating in increasingly digital and automated manufacturing environments, a shift represented by "Industry 4.0" with significant and important implications for community colleges and other training providers. Since 2010, this industry skills makeup has largely held steady though there has been some growth in high-skilled workers' share of life sciences industry employment from 43%, in 2010, to 47% today. Gains in the high-skilled workforce have come at the expense of low-skilled occupations, which have lowered their share of industry employment. Middle-skilled workers' share has held steady over the last decade.



*From CSBI, 2021 Life sciences Workforce Trends Report: Taking Stock of Industry Talent Dynamics Following a Disruptive Year, prepared by TEconomy Partners, LLC pg.17.)

“We and the life sciences industry in general are seeing strong growth, making the market for talent very competitive. In the midst of our business expansion, talent scarcity is that much more pressing for us.” - Life Sciences Industry Executive

In recruiting entry-level talent, 72% - 73% of life sciences company Hiring Survey respondents specified that a 4-year degree and demonstrated competencies/skills each were “somewhat important” or “very important” in their hiring decisions. Not far behind, 65% viewed 2-year college credentials and certifications from 2-year colleges each as “somewhat” or “very” important. While companies expressed less familiarity with the value of newly emerging “badges” or 3rd-party certifications, 40%-46% saw these as “somewhat” or “very” important.

Figure 11: Relative Importance of Credentials in Entry Level Hiring Decisions.

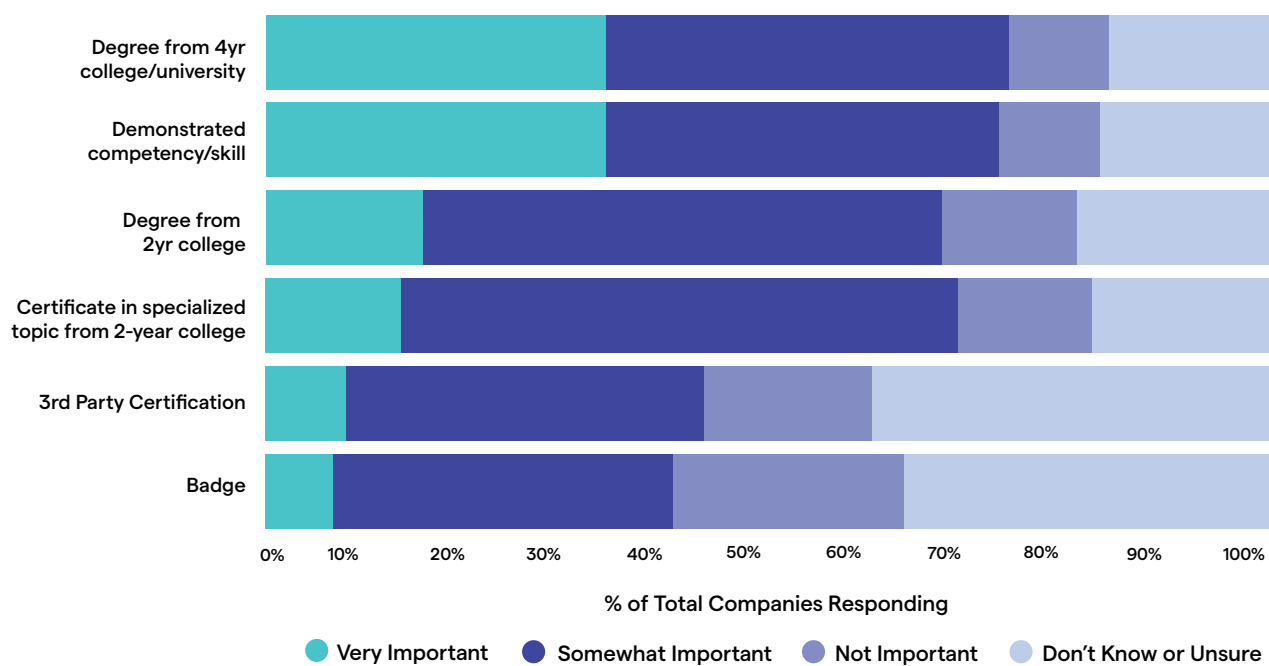


Figure 11. Source: Hiring Survey. Total number of company responses for each type of credential: 4-year degree (n=315), demonstrated competency/skill (n=283), 2-year degree (n=286), certificate from 2-year college (n=274), 3rd party certificate (n=277), badge (n=271)

Larger companies and companies in three sectors (Drugs & Pharmaceuticals, Industrial Biotech and Agricultural Feedstocks & Chemicals) placed higher value on 4-year college/university degrees and reported slightly higher frequencies of requiring them across functional areas (data from Hiring Survey not shown). 35 % of companies overall noted that 4-year degrees were very important for entry-level hires; compared to 41% of companies with greater than 500 employees.

Lab technician, research, clinical research and manufacturing are common career entry points for new technical talent. These functional areas were among the most commonly cited in the Hiring Survey, as areas targeted overall for hiring during the next 12 months: 54% of Hiring Survey respondents planned to hire lab technicians; 49%, clinical research professionals; 48%, research scientists; 39% manufacturing and production staff; 38% computational biologists/biostatisticians; and 37% engineering – product and/or process development staff.

VALUE OF CERTIFICATES & CERTIFICATIONS

Standardization in education and training for the life sciences industry technical jobs is taking a big leap forward with industry-recognized credentials. Even with a wide range of quality educational programs in bioscience and biotechnology, employers still struggle to find and retain qualified entry-level technicians who understand the needs of the position, particularly since a Bachelor's degree - often a minimum qualification for entry-level technicians - does not always assure prior hands-on skills training.

BioTC

Biocom California Institute is leading initiatives to provide an industry-driven approach to curriculum development through vetting existing curriculum, participating in new course development, and awarding programs that meet the needs of industry with a Biocom California Institute stamp of approval.

The Biocom California Institute Technician (BioTC) Certification is the first credential to be granted this designation. This industry-recognized credential will be awarded to graduates of bioscience/biotechnology programs who demonstrate proficiency across a range of standardized, industry-defined core competencies. This certification has been developed through a unique collaboration between these public and private sector partners: Grifols Biologicals, Biocom California Institute, Verdugo Workforce Development Board, Verdugo Jobs Center, Los Angeles Valley College, and Los Angeles Mission College. The BioTC reflects the direct input of leading bioscience and biotechnology employers, including: Amgen, Gilead Sciences, Neutrogena, Kite, Prolacta, and Takeda.

Biocom California Institute partnered with the Chancellor's office of the California State Universities PaCE program to form a consortium dedicated to developing and providing certificate programs for the Life sciences industry throughout the State of California. Current campus consortia members, Cal State Fullerton, Cal State Long Beach, and Cal State LA are developing Biocom California Institute approved curriculum that will provide students with a consistent experience in education and learning outcomes across all participating campuses.

BACE

Fueled by a spring 2021 \$1.2M grant from the National Science Foundation (NSF), California stakeholders are establishing a task force designed to bring the Biotechnician Assistant Credentialing Exam (BACE) to the state as a tool to certify an individual's capabilities and accelerate the development of the bioscience workforce. The BACE credential was developed through engagement with industry representatives, and the exam is already on the approved lists of industry-recognized credentials for seven states and the District of Columbia. Adding California to the list of states who have formally adopted the BACE will increase its potential to become the industry-recognized system for entry-level biotechnicians in California.

California Life Sciences and Biocom California Institute will join the quarterly Task Force, which will include industry representatives, workforce/economic development board representatives, 2-year college faculty, and state Career Technological Education (CTE) leaders.



A Growing Demand for Skilled Technical Workforce in the Life Sciences

It is worth noting that, while there is a continued strong demand for skilled talent in STEM and related fields, and for people with 4-year and advanced degrees, there is a growing concern in the U.S. regarding the critical shortage of a “Skilled Technical Workforce” (STW) – what the National Science Board (NSB) defines as “the millions of men and women with STEM skills and knowledge who do not have a bachelor’s degree” – who are needed in order to maintain U.S. competitiveness in advanced industries and life sciences innovation.

Noting that the National Academies expect 3.4 million skilled technical jobs to go unfilled by 2022, the NSB has elevated the emphasis on this talent pool, pointing to its overall strategic importance and the viable career opportunities these positions afford. We echo the NSB’s desire to “change the message” around these careers by recognizing the critical role they play in overall U.S. competitiveness, and support the NSB’s recommendation that we focus on high-quality data and information about the skilled technical workforce, leverage federal investments and build partnerships to develop this critical talent.

This is part of the rationale underlying our desire to highlight the important network of California community college advanced technical education programs that have been training a skilled technical workforce for careers in the life sciences - with the support and partnership of the life sciences industry - for over two decades. (The above is included in the CSBI, 2021 Life Sciences Workforce Trends Report: Taking Stock of Industry Talent Dynamics Following a Disruptive Year, prepared by TEconomy Partners)

CA Community Colleges (CCC)

Response to Demand for a Skilled Technical Workforce in Life Sciences

The Life Sciences/Biotech Initiative supports Career Technical Education (CTE) programs in the life sciences and is funded by the California Community Colleges Chancellor’s Office’s Workforce and Economic Development Division. Its mission is to help create pathways in the life sciences and support the development of a skilled technical workforce for life sciences industries in California. The initiative works closely with faculty, industry trade associations, industry partners, and workforce development partners to maintain awareness of industry workforce needs and guide relevant curriculum development that aligns with those needs.

The Life Sciences/Biotech Initiative has a robust statewide community of practice among community college life sciences

California Community Colleges Biotech Benchmarks:

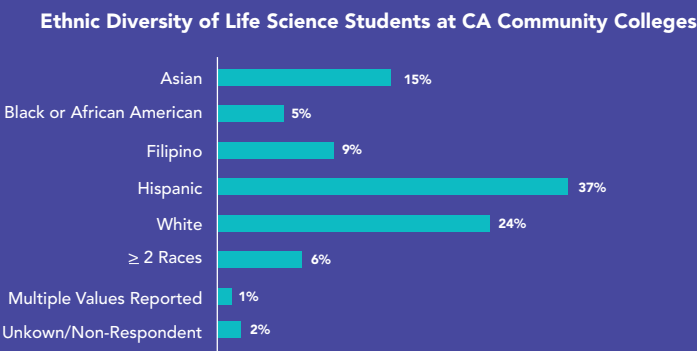
- 
34 community colleges have active programs in biotechnology, biomanufacturing, medical laboratory technology, chemical technology, and/or laboratory science technology
- 
2 community colleges offer a **Bachelor’s degree in biomanufacturing** (Solano & MiraCosta Colleges)
- 
11 community colleges have **life sciences programs** under development
- 
> 2,600 students are trained annually in biotechnology, biomanufacturing, medical laboratory technician, chemical technology, and laboratory science technology programs
- 
> 1,800: Number of job-ready students annually prepared to enter the workforce

A Growing Demand for Skilled Technical Workforce in the Life Sciences

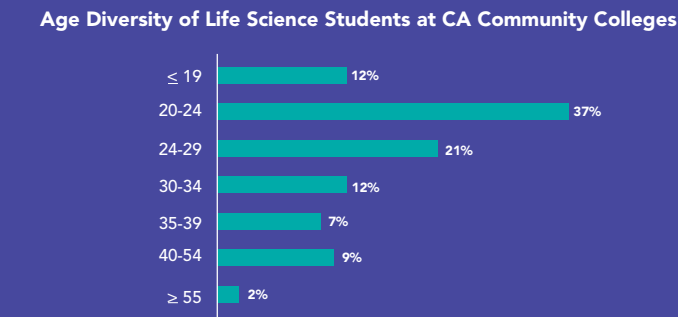
faculty that has facilitated inter-campus collaborations and several federal grants, including National Science Foundation (NSF) Advanced Technical Education (ATE) and National Institute for Innovation in Manufacturing Biopharmaceuticals (NIMBL) grants, and membership in BioMADE, a DoD-sponsored grant to advance bioindustrial manufacturing technologies through manufacturing innovation, education, and collaboration. It also collaborates with and receives resources and support from InnovATEBIO, an NSF-supported National ATE Biotechnology Education Center.

The CCC Initiative looks to industry partners to guide and assist in training students by offering internships, industry tours, classroom visits, and serving on program advisory boards. It also seeks opportunities for faculty to gain industry experience by shadowing or doing externships in companies. Industry professionals that love to teach are encouraged to join the faculty as adjunct instructors.

The Life Sciences/Biotech Initiative supports high school outreach through manufacturing and supply chain projects at the colleges. In a work-like environment created on campuses, college students practice quality, documentation, and compliance while manufacturing materials for lab kits such as plasmids, plates, reagents, and buffers, and assembling the kits. The lab kits are distributed to high schools for use in biotech classes.



Life sciences employers that hired students trained at CA community colleges include and are not limited to: Abzena, Amgen, Argonaut, Avid Biosciences, Azzur Group, Bayer, Beckman Coulter, Bimeda, BioLegend, BioMarin, BioRad, Caltech, CellVi, Cibus, City of Hope, Embitec, Eurofins, Freudenberg, Genentech, Gilead, Grifols, Illumina, InovaDx, Integrity Bio, Kite Pharma, Millip Oak Crest, Organogenesis, Organovo, PerkinElmer, Polypeptide, Prolacta, Provivi, Salk Institute, Sanford Burnham Prebys Medical Discovery Institute, Scripps Research Institute, Takeda, ThermoFisher, Twist Bioscience, UCSD, Vet Stem, and Xencor.



Trend 2

COVID-19 CHANGED THE WAY WE THINK ABOUT WORK AND THE WORKPLACE: COMPANIES EVALUATE REMOTE WORK AND OTHER WORKFORCE MANAGEMENT INNOVATIONS

The novel coronavirus caught our attention on March 4, 2020, when California Governor Gavin Newsom declared a State of Emergency; its impact became palpable on March 19, with the Governor's state-wide Stay-at-Home Order. Companies across California abruptly pivoted to untested models of remote work while rapidly developing procedures and protocols that allowed essential job functions to return-to-work in modified "safe" workplaces and with altered schedules.

As the pandemic continues to be a major disruptor of "business as usual", many employees are still working from home. Companies interviewed explained they are evaluating the long-term implications of how and where we work and assessing which work activities must take place on site. This creates unique challenges as well as opportunities in thinking about employee engagement, productivity, innovation and collaboration. Industry executives described the past year as a forced experiment in working remotely. Prior to the pandemic, most were skeptical of remote work and approved it only in extraordinary situations. How they think about remote work today is very different. How they now envision their future workplaces varies by company. One company described a new multi-tier system of categorizing a range of jobs from "must be on site full-time" to "fully remote", and many are looking at various hybrid remote/on-site options for multiple positions.

In California, the state trade associations, California Life Sciences (CLS) and Biocom California, as well as national associations AdvaMed and PhRMA, were active at both the state and local levels, working with industry partners to ensure that the industry's essential workforce was allowed to operate during the shut-down. California was also very active in ensuring that biotech facilities were added to the list of critical infrastructure workers.

Vaccines were another important win for industry as the trade associations similarly worked to ensure that its essential workforce received priority status in the early stages of the vaccine rollout in order to continue its development of life-saving devices, tests, therapeutics and vaccines in record time.

“The pandemic has not slowed us down any. Work is different and even more efficient in many ways. In some ways we are even more engaged. We are working harder and smarter.”
-Life sciences Industry Executive

Although the abrupt transition to remote work has been difficult, a number of companies we interviewed noted no significant loss in productivity. Some even reported enhanced productivity. It may be too early to assess whether such gains are sustainable or the result of a sprint of activity in the face of a crisis.

Some companies noted productivity losses and expressed concerns that current systems, processes and workflows are not sufficient to sustain long-term employee engagement, collaboration and innovation. Interviewed companies also reported signs of increased worker burn-out and employee turn-over as the pandemic lingers.

Most interviewees agreed, however, that with remote work, they performed better than expected. Adoption of remote work is on the rise and some form will continue beyond the pandemic. In the Hiring Survey 66% (n=222) of life sciences companies indicated they are implementing, expanding, or considering implementing remote work options with 96%

of respondents citing pandemic safety as a major rationale. The shift to remote work was consistent across company size classes, (60% - 80% adoption or consideration across company size classes).

Companies' visions of the future workplace vary. One interviewed executive described it this way: “We are an innovation company and recognize the magic that comes from connections. I like to call it ‘casual collisions’ - those unplanned workplace encounters that spark creativity and new ideas.” Such companies saw it as imperative that employees return to in-person work once it is possible to do so safely. Most interviewees, however, envision futures with more distributed workforce models, where some of their employees work exclusively on-site, some are fully remote and still others have flexible work schedules (i.e., customized, non-standard hours or hybrid in-office and remote work schedules). While details remain to be worked out, this predicts a future of work that looks quite different for many employees of California's life sciences companies.

Remote & Flexible Work Models

Benefits

- Addresses local cost-of-living and transportation issues
- Improves employee quality of life and work-life balance
- Expands target geography for sourcing talent, especially for highly competitive skills sets
- Provides a greater blending of personal and professional lives, allowing employees to bring their “whole selves” to work
- Helps life sciences companies compete for talent with the tech industry, which historically has offered more remote and flexible work opportunities as a company “perk”

Challenges

- Disrupts company culture and traditional communications
- Weakens social interaction and cohesion; increasing feelings of being disconnected
- Burdens individual with new work-life balance management challenges, compromising well-being and leading to burn-out
- Diminishes collaborative creativity
- Presents managers with new challenges in remote leadership and management
- Weakens employee engagement, leading to higher turnover
- Creates potential fears over job security and career progression

TREND 2: COVID-19 CHANGED THE WAY WE THINK ABOUT WORK AND THE WORKPLACE: COMPANIES EVALUATE REMOTE WORK AND OTHER WORKFORCE MANAGEMENT INNOVATIONS (cont.)

A transition to a more distributed workforce model has significant implications for technology and physical infrastructure. “This changes where we sit people and the amount of real estate we need to seat everyone.” Several interviewees foretold smaller office footprints and redesigned office layouts with more hoteling (i.e., reservation-based, unassigned seating) space. They asked: “who really needs to be in the office?” “Who needs a dedicated office?”

Forced remote work during the pandemic has led to growing confidence in and adoption of rapidly advancing technologies for communication and distributed, collaborative work. This is causing companies to consider other business innovations to save resources and enhance productivity, including stricter guidelines to limit nonessential business travel, transitions to more fully remote board meetings and new approaches to clinician collaborations and clinical trial designs that could expand trial enrollment and allow more remote subject monitoring.

The ongoing shift toward more distributed workforce models is allowing companies to widen their recruiting nets to now include distant geographies. This will be particularly relevant for some hard-to-fill skill sets, and likely will result in companies hiring more distant workers who will not relocate for work and therefore remain fully remote. The companies we interviewed reported that they are now evaluating more candidates from other geographic regions, when in the past relocation costs and California’s high cost-of-living were obstacles of serious consideration. Remote recruiting, interviewing and on-boarding require more training and coaching for interviewing teams to both assess fit and to onboard new talent once hired.

The pandemic also has exposed or created new workforce challenges. A number of companies interviewed expressed concern about workforce destabilization as the pandemic continues. They pointed to signs of pandemic-related burn-out due to overwork by some employees, diminished productivity from others, and decisions about career/life changes, as contributors to a recent uptick in voluntary resignations and a possible premonition of further employee turnover.

Parents, and in many cases, women employees, in particular, are burdened with additional family responsibilities, including childcare, and home schooling during the pandemic. As schools re-open for in-person classes, employers are watching to assess the long-term impact on recruitment and retention. Will such factors widen already existing gender gaps in the workplace?

Companies noted a cautionary wave of employees relocating beyond commuting distances; possibly motivated by employee choices to take advantage of lower costs of living in other states, to improve work-life balance, or to be closer to family during these uncertain times. Will these employees return to in-person work after the pandemic? And will all of them be able to? In one account, an employee who made such a “temporary” relocation decision at the start of the pandemic now is unable to find affordable housing in California, making it impossible for him to return to in-person work with his employer.

“Our R&D Clinical Trial Specialists are more virtually enabled than before.... This opens the door to doing more clinical trial management remotely... and could open clinical studies to more racial and socioeconomic diversity with more rural subjects.”

“We will continue to support virtual working for roles where this makes sense, while still prioritizing onsite work for laboratories, manufacturing operations, and commercial brand teams.”

-Life sciences Industry Executive

While company culture can be an effective antidote to numerous retention threats, it, too, has taken a hit during the pandemic. Companies recognized that with so many employees working remotely and feeling less connected, they need to be creative in offering novel programs and tools to engage and inspire their teams. Retention metrics will be heavily contingent on balancing these creative efforts to build and maintain culture among a more distributed workforce with the flexibility and self-direction that many employees increasingly seek.

Industry’s vision of the future state of how and where we work is changing. Each company is evaluating which workforce models best fit its specific needs. The near future promises a rich variety of solutions, where remote and flex work will be more prevalent.

Competition for Talent

At a time when companies are experiencing growth and strong demand for additional talent, and concerns over pandemic-related employee burn-out and turn-over, they also are battling multiple competitors for talent, including:

- (a) geographically distant life sciences companies that have embraced distributed workforce models and are aggressively recruiting experienced talent,
- (b) both distant and proximate tech companies that recruit heavily for many of the same skill sets; some of these tech competitors have business models that are converging with healthcare and the life sciences, and
- (c) newly emergent life sciences companies. Emerging companies may provide attractive opportunities for employees to move to a smaller company and gain a jump in job title, responsibility and compensation.

While competition from tech and emerging life sciences companies is not new, new capital inflow into the sector is fueling strong demand for talent at the same time that the past year’s disruptions are sparking self-reflection, exploration and a desire for change among many employees.

Trend 3

“SOFT SKILLS” ARE INCREASINGLY VIEWED AS PREDICTORS OF CAREER SUCCESS: ADAPTABILITY, RESILIENCE, AND COMMUNICATION RISE TO TOP OF DESIRED SKILLS AS WE NAVIGATE UNCHARTED ECONOMIC AND INDUSTRY TRANSITIONS

Interviewed companies continued to stress the criticality of deep domain knowledge and experience for their robust workforce. Even more so, however, was the broad acknowledgement that success today increasingly requires the additional mastery of “soft skills” - a cluster of workplace competencies such as teamwork, communication, critical thinking, problem-solving and flexibility – also referred to as “foundational” or “essential skills” in workforce lexicon.

As the COVID-19 pandemic is creating ongoing disruption and uncertainty, it is not surprising that companies we interviewed almost universally identified *adaptability, agility, flexibility and resilience* as key predictors of employee success. Additionally, with more companies embracing distributed workforce models, communication, empathy, inclusiveness, problem-solving, critical thinking, emotional intelligence, commitment to continuous learning and improvement, and internal passion were cited as increasingly valuable.

One area where demonstrated agility and adaptability is particularly important is in the embrace of new technology solutions. We live in an era of big data, where data is proliferating across functional areas and data analysis increasingly drives decision-making at all levels of an organization. This makes tech savviness, data fluency, and comfort with both data analysis and digital platforms more important overall and more relevant for a broader range of positions than ever before. The recent trend toward more remote work has accelerated companies’ adoption and reliance on new technologies and tools for communication and collaborative work in particular. The company leaders we interviewed described both traditional soft skills and the ability to apply technology to communications and problem-solving as a set of foundational workforce skills that play heavily in hiring or promotion decisions.

This emphasis on foundational skills clearly does not supplant the need for domain expertise and experience. The latter could be considered “table stakes,” while soft skills are increasingly viewed as predictors of success. As companies grow and their product pipelines mature, they demand subject-matter expertise across the spectrum of technical and business disciplines, including microbiology, synthetic biology, cell/gene therapy, bioinformatics, pharmacology, regulatory affairs, clinical development, fermentation, bioengineering, process development, manufacturing, quality, business development, finance, marketing, software development, analytics, and artificial intelligence. Executive interviewees clarified that they do not need new technical skill sets or areas of expertise; but instead, additional talent to supplement current competencies, allowing them to scale up existing operations.

“Hard skills will always be important Of growing importance is the “mindset” we need. We need people who embrace and drive diversity of thought. They need to be flexible and creative about how they do things. The past year certainly taught us of the importance of flexibility.”

-Life Sciences Industry Executive

The Interviews and Hiring Surveys each told us that employers view prior work experience, even for entry-level positions in many cases, as general signals of competency that are predictive of success. This includes knowledge of how industry works, effectiveness on cross-functional teams, the ability to drive collaboration, and an appreciation of “good enough” over perfection.

Finally, interviewees acknowledged new challenges for leadership and management. The current COVID-19 disruptions, plans for a more distributed workforce, imperatives for more inclusive workplaces and changing communication and collaborative technologies, all contribute to the need to rethink the way we lead and manage people. Understanding how to support leadership through these changes will be critical for ongoing company and manager success. The industry’s California neighbors in the tech industry, with their greater experience with both dispersed and distributed workforce models, might provide valuable lessons for life sciences companies moving in this direction.

“Agility has always been a watch word, but now it is a necessity. Employees in jobs that have been predictable or routine may be more challenged by the demand for agility in the workplace.”

-Life Sciences Industry Executive

Trend 4

AN ARRAY OF NEW OR AMPLIFIED INITIATIVES PUSHES DIVERSITY, EQUITY AND INCLUSION (DEI) INTO THE SPOTLIGHT WITH BROAD RECOGNITION WITHIN THE INDUSTRY THAT WE MUST AND CAN DO MORE

California's life sciences companies have long recognized that diverse teams achieve better outcomes and accelerate business performance. However, while most have built diverse teams, the companies we interviewed acknowledged that more work needs to be done to actively include

“[George] Floyd’s killing, in the midst of the coronavirus pandemic, which has disproportionately infected and killed black people, has exposed long-standing racial inequities in every aspect of American life and forced a deep reckoning across society.”

“Resources to understand America’s long history of injustice and inequality” October 9, 2020 The Washington Post

those who have been excluded in the industry’s talent pipeline; to deliver internal equity; to add diverse voices to leadership and boards; to adopt more inclusive cultures; and to focus research and clinical trials on those who have been underserved by advancements in the industry. The high-profile, tragic killing of George Floyd and too many other Black Americans, and the rise of the Black Lives Matter movement, have – as many executives stated – “brought us to a tipping point,” compelling

companies to speak out and take meaningful action to redress practices that have excluded, ignored and undervalued certain communities.

Diversity, Equity and Inclusion (DEI) initiatives have been elevated to the level of strategic focus for multiple California life science companies. The executives we interviewed passionately described a wide array of discussions, programs and initiatives their organizations have embraced to address inequities that adversely impact Blacks, Asians, Latinos, women, religious minorities, veterans, and the LGBTQ community. While most of these re-invigorated discussions began with a renewed focus on the systemic exclusion of Black Americans in 2020, they now also include discussions of gender and LGBTQ equity and violence against the Asian American Pacific Islander (AAPI) community.

Companies have re-directed recruitment efforts to identify more diverse candidate pools. Expanding beyond their dependence on traditional recruiting targets, numerous companies have begun focusing more on Historically Black Colleges and Universities (HBCUs) in recruiting interns and entry-level hires. They have partnered with professional organizations and non-profit and academic job training programs serving underrepresented populations and have engaged recruiters who target diverse candidates to increase access to diverse, experienced talent.

Open, internal company discussions on DEI issues have been one essential step in helping organizations reflect on their current cultures and challenges. Even companies with strong records of proactive DEI initiatives in the Interviews described how they have begun listening to employees and reaching out to community partners with new vigor. Several company leaders reported that these discussions have been difficult, though illuminating, and revelatory of internal practices and policies that employees felt were inconsistent with long-held DEI goals, and/or worse, discriminatory.

“This is not the time for press releases about support. We need programs and actions to move the needle.”
- Life Sciences Industry Executive

Accompanying or resulting from these discussions is a new wave of employee engagement in DEI initiative-planning, expanded training on implicit bias and inclusivity, creative changes in recruitment, philanthropic investments / employee-giving campaigns to support communities of color, increased support or participation in programs targeting underrepresented students, and targeted scholarship programs. Interviewees described broad employee participation in DEI task forces charged with designing plans for community engagement, reviewing internal culture and processes, updating strategies for recruitment and advancement, and more.

These bottom-up efforts, together with top-down directives, have injected a new sense of urgency in DEI programs, differentiated from prior responses that have been criticized as “all talk; no action.” Interviewees described efforts to launch new DEI programs, most constructed with a new level of formality and accountability, anchored in core business practice and key performance indicators. Signals of this durability are the number of executives reporting DEI metrics in their individual performance goals, as well as the creation of multiple new DEI leadership positions on company leadership teams. Finally, companies have been making their commitment to DEI initiatives more explicit and more public.

Employee Resource Groups (ERGs) are one traditional approach for promoting inclusive work cultures. In the Hiring Survey, 65% of California companies reported supporting or offering ERGs, vs 49% nationally. Across company size, in California, the range was 45% - 75%. Those company ERGs support a wide range of demographic groups.

Figure 12: Company ERGs

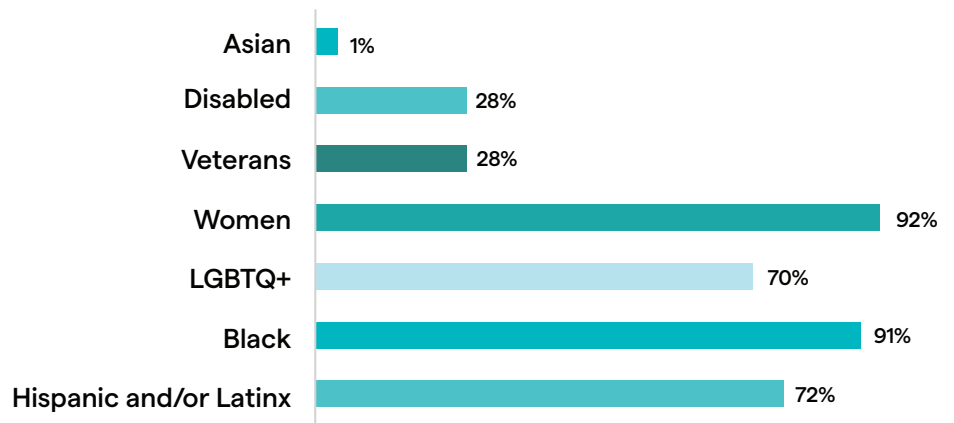


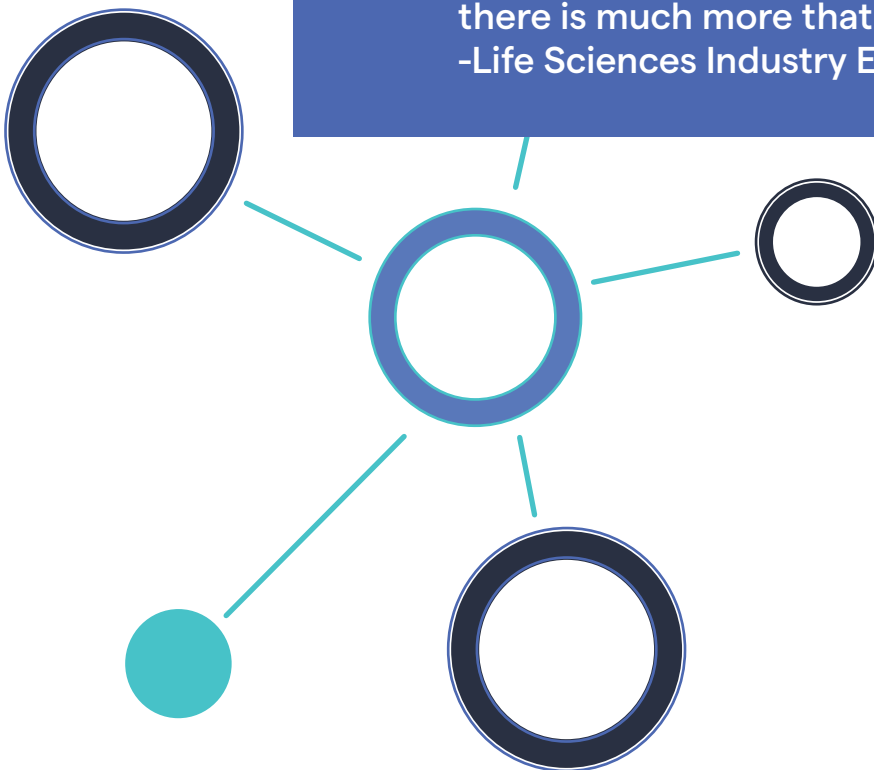
Figure 12: Share of responding companies with employee resource groups (ERGs) for various employee groups (n = 311). Source: Hiring Survey

“I am heartened that these feel like sustained long-term efforts that will change things for the better. If the horrible [racial] incidents...of the past year have a silver lining, this is it.”
-Life Sciences Industry Executive

Executives in companies of all sizes that we interviewed spoke of inclusivity within their own organizations, but also in their business ecosystems, and more broadly in the communities in which their employees work and live. Even startups and small companies - many with diverse staff, but without formal DEI initiatives - described working to build diverse, equitable and inclusive cultures and practices into their young companies, while several life sciences incubators are offering DEI-specific workshops and tools to help.

Interviewees spoke of reviewing their supplier and partner networks, clinical trial designs, and clinical trial subject recruiting plans all through a DEI lens. Sustained change and broader relationship-building in these extended networks will take ongoing effort and time, particularly in those communities that have suffered from long-term discrimination and whose skepticism and mistrust will need to be overcome. Strong metrics will need to be developed to demonstrate the industry's sustained commitment to inclusion and change.

“Many companies are leaning-in in new ways to acknowledge that there is systemic racism. Some of our internal systems perpetuate systemic racism, even if we aren’t aware of it. We’ve launched a series of meaningful and raw internal discussions about these issues. These have been especially important for our minority colleagues who now tell me they feel they can bring their whole selves to the workplace. Still, there is much more that needs to be done.”
-Life Sciences Industry Executive



CALIFORNIA LIFE SCIENCES COMPANIES MOBILIZE TO ADDRESS DIVERSITY, EQUITY & INCLUSION

In the wake of George Floyd's killing and the calls across the nation for racial and social justice - further fueled by the health disparities so brazenly revealed by the COVID pandemic - the California life sciences industry both accelerated and augmented formal and informal DE&I strategies within their own companies, in some cases to the tune of millions of dollars. Beyond these committed investments from their own companies, many of these companies also came together as communities of action mobilized by two of California's state industry associations.

Member companies of California Life Sciences began meeting over the summer of 2020, determined to develop a concrete set of measurable actions designed to confront the systemic barriers that have led to the exclusion of Black, Indigenous and Other People of Color (BIPOC) at all levels of the business. These include actions directed at the talent pipeline, by increasing STEM opportunities for BIPOC students, and promoting the hiring, development, and advancement of BIPOC talent; investing in BIPOC entrepreneurs and board members; and providing underserved communities with equitable access to and coverage for care. Officially launched in February 2021, the CLS Racial & Social Equity Initiative is led by an executive director who will drive strategy and oversee the nearly \$3 million raised to support relevant community programs, over three years, that will create measurable impact in the areas of focus.

In June of 2021, the Biocom California industry association unveiled a DE&I Member Pledge to Ignite Lasting Change in Life Sciences, a commitment to catalyze lasting change in the industry. Born out of the strategic discussions of the Biocom California DE&I Task Force and through the findings of the Biocom California Institute's survey analyzing the DE&I landscape, the pledge asks members to commit to building diverse organizations and to create pathways that provide opportunities for BIPOC and other currently underrepresented populations within the life sciences industry. The member pledge provides concrete sample strategies across a range of areas to help signatories, for example, to attract, promote and retain a diverse organization, to build an inclusive work environment, and to be accountable of their actions by committing to develop and share metrics.

The imperfect storm of the COVID pandemic and the drive to address systemic racism continues to galvanize the California life sciences industry around inequities of access - to careers, advancement, leadership, investment, and health. California life sciences leaders have stepped up to commit to and be accountable for taking on this multi-faceted agenda, and to elevate the voices and input of those who have largely been excluded in order to create lasting change in the make-up, actions and impact of our industry.



Trend 5

NEW ENERGY BEHIND INDUSTRY-ACADEMIC COLLABORATIONS ADDRESSES SHIFTING DEMANDS FOR TALENT

STEM Defined

While definitions can vary, STEM (Science, Technology, Engineering and Mathematics) generally includes the fields of computers and math, architecture and engineering, life and physical sciences. STEM Occupations refer to jobs in these fields as well as managerial and postsecondary teaching related to these fields. This report references the STEM occupational definition adopted by the U.S. Bureau of Labor Statistics (BLS).

The California life sciences companies we interviewed agreed on the essential role of strong STEM education and training for establishing a skilled workforce for the industry and for supporting the communities in which they operate. They spoke passionately of the need to ensure that all students, especially those who are underrepresented in the industry, can access its rewarding and well-paying careers. They did so while acknowledging the magnitude of the educational gaps and inequities and the critical need to collaborate with academic partners and programs to address them.

Over the years, this report has chronicled the ways that life sciences companies of all sizes have engaged with various academic or other STEM programs to bolster the industry's talent pipeline. The Interviews and Hiring Surveys tell us that most large life sciences companies stand behind a diverse portfolio of initiatives and partnerships, ranging from early childhood education on through to programs targeting graduate students and post-docs, some even offering externships for faculty. Many of these programs have been established over years of collaborations with academic partners.

Smaller companies have also stepped forward to support science education, though often less formally. Resource constraints have for the most part, made it impractical for them to imagine, design, build and scale many such programs. As a consequence, their efforts have tended to be smaller in scale and employee-driven or focused on a single department or school at an academic institution. Interviewees expressed a desire to do more, lamenting the gaps in resources or knowledge needed to tap into existing STEM programs and partnerships.

In the Interviews this year, executives from companies of all sizes discussed the ways that they are engaging with academic programs across all educational levels, with K-12 programs usually focusing on exposing and trying to excite and inspire students about science through hands-on activities, company tours, career talks, and more. At the high school-, and in some cases middle school-

levels, teachers have engaged industry in robust science curriculum development, science fair competitions, and opportunities to connect with staff scientists in round tables and career panels to augment students' early career exploration. At the community college and college/university levels, interviewees described an increasing array of robust industry-academic partnerships.

Both the Interviews and Hiring Surveys confirmed that internships that enable students to develop valuable work-based skills and experience, while allowing host companies to test-run possible entry-level talent, are paramount because of their recognized high impact. In fact, 43% of Hiring Survey respondents indicated that they offered college/university student internships. Liability and other concerns have kept most companies from offering internships to underage high school students, though more companies are moving – or express a desire to move – into this area, particularly for programs targeting BIOPC students, in an effort to start engaging students in meaningful science experience earlier.

Beyond internships, companies are embarking on a number of creative, concrete exercises with academic partners – particularly at the community college-level – to help with the development of specific industry-needed skills to meet the growing demand for a skilled technical workforce. Industry and academic partners have begun experimenting with and rolling out new certifications, “badges”, and apprenticeship programs aimed at developing industry-recognized skills needed to help meet demand. Through state-funded initiatives such as the California Career Pathways program, academic partners are overcoming institutional barriers in order to develop strong career pathways that connect sector-based high school, community college programs through dual enrollment and articulation agreements designed to help students navigate career-focused education and industry opportunities, with strong participation with industry partners.

While the desire for industry-academic collaborations has continued to build momentum – even during Stay-at-Home orders, when many companies and employees stepped in to help address remote-learning challenges – what was notable this year was the increased energy and passion interviewees expressed about the need to work with academic partners to bring more students into the industry. Whether the continued robustness of the industry as it responded and adjusted to COVID, the recognition that far more needs to be done to create access for those who have been largely excluded from the industry, or simply the growing awareness that collaborations with academic partners is essential for co-developing necessary talent- interviewees from companies of all sizes indicated a desire to bolster and develop new relationships with academic partners to inspire and develop a new generation of talent.

There is no question from the Interviews that the national awakening to, and subsequent focus on, systemic exclusion has energized the California industry's desire to focus on academic institutions and programs that serve underrepresented students. At the K-12 level, this has encompassed targeted efforts, such as computer and hotspot donations, after-school tutoring and mentoring, reading/literacy programs, college prep guidance and more. Some companies have shifted or are considering shifting their internship recruitment efforts to schools with large underrepresented populations. At the (community) college- through graduate-levels, this has included career mentorships, scholarships, advisory board service, and more.

Increasingly, the industry's formal internship programs are expanding their focus on equity, specifically targeting historically excluded groups – some through partnerships with Historically

Black Colleges and Universities (HBCUs) - females, and/or first- generation college students. These internships are not restricted to STEM fields, but extend across functions that span research, manufacturing, project management, marketing, technology, business and law in order to bring diverse talent into all parts of the industry.

Across the board, the companies we interviewed saw there is much more that must be done to bolster STEM education, particularly in areas such as improved and updated curriculum, enhanced teaching of foundational skills, greater awareness of industry career opportunities for students, teacher professional development, and expanded internship opportunities. Most companies interviewed wanted more interactions and access to available academic programs and partnerships. Sharing success stories, best practices and tools across the ecosystem and engaging in broader industry-academic collaborative discussions are important next steps in mapping the industry’s coordinated support of equitable education and career development.

Figure 13: Industry Supported STEM Education Programs Across Grade Levels

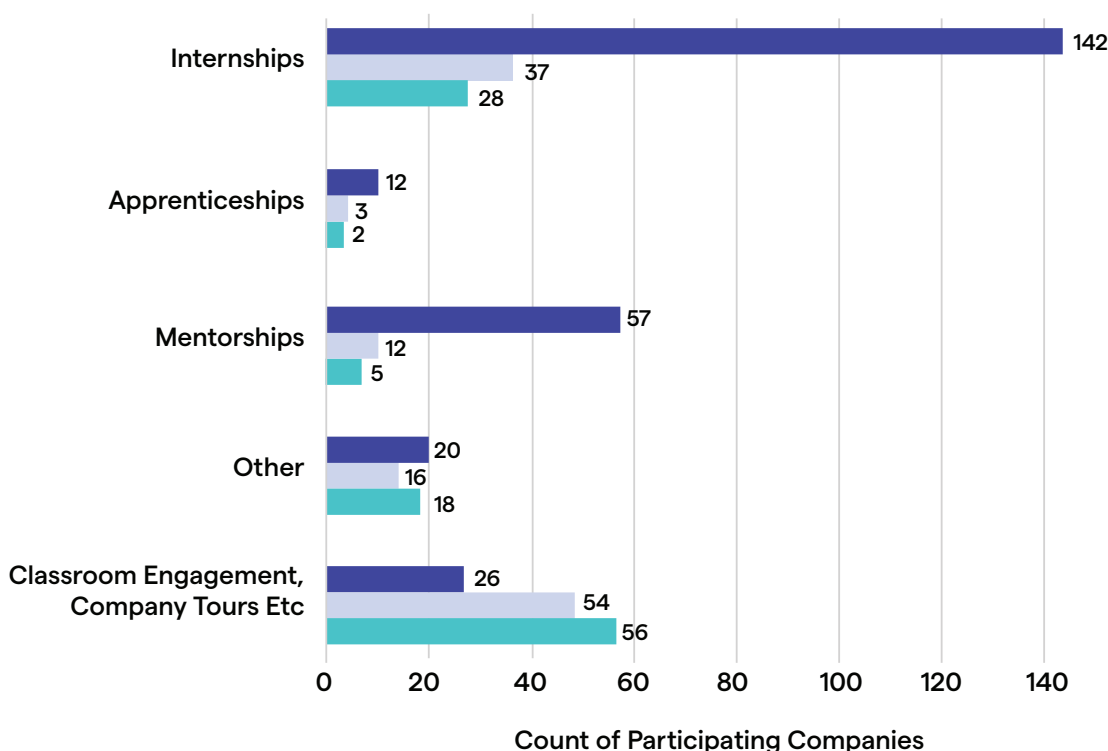


Figure 13: Hiring Survey responses on company (n=334) involvement in initiatives to seek and develop a more diverse STEM talent pipeline. Results are summarized here by program type and by the targeted academic grade level.

INDUSTRY-ACADEMIC PARTNERSHIP SPOTLIGHT

2020 COVID-19 pandemic disruptions wreaked havoc on a global scale while also bringing to light deep-rooted disparities in our education systems. The historic shutdown of schools for over a year in California and the prolonged period of remote learning has impacted students and their families in alarming ways - particularly among low-income households and communities of color.

Fortunately, industry-academic collaborations, such as the one between Genentech and the South San Francisco Unified School District (SSFUSD) have enabled quick and creative responses to the widening learning gap, and have engaged other companies to confront this challenge.

Genentech and SSFUSD: Building a Diverse Pipeline of Local STEM Talent

Since 2015, Genentech, which was founded in South San Francisco, has partnered closely with the local school district to bring premier STEM education programs to all 9,000 K-12 students, many of whom are English language learners from low-income households. Through Futurelab, students are not only exposed to and inspired by science from elementary school through high school, but they also have opportunities to improve their college readiness and explore dynamic careers in the life sciences. Genentech volunteers provide mentorship and coaching along every step of a student's STEM journey.

Genentech and SSFUSD: Building a Diverse Pipeline of Local STEM Talent

To continue building on the success of Futurelab and enthusiasm of other businesses to make a difference for local students (see below), Genentech plans to expand the program throughout the Bay Area and California. By 2026, they hope to reach 2 million high school students in California with a newly designed open-access digital biotech curriculum and support more than 750 California teachers through an incubator model aimed at providing biotech teacher training and credentialing, teacher stipends and professional learning communities.

Science Empowerment Initiative to Address Remote Learning & Digital Divide

To expand this impact on local students, Genentech partnered with California Life Sciences (CLS) in early 2020 and 2021 on the Science Empowerment Initiative (SEI) to build a community of life sciences companies with a collective interest in supporting and inspiring SSFUSD students to pursue STEM careers. In both years, both in person and remote, approximately sixty new volunteers from ten other local companies joined as mentors and coaches for Futurelab's annual Helix Cup science competition for eighth-graders.

When the pandemic hit, those partnerships paid off even more, responding to the fact that most SSFUSD students didn't have computers or access to the internet at home. Recognizing that the digital divide would make remote learning nearly impossible, and spurred by a Genentech Foundation matching challenge, the SEI community raised nearly \$650,000 and provided the district with 7,000 digital devices, ensuring that all students were able to start the fall school year online.

Recognizing that the digital divide would make remote learning nearly impossible for most SSFUSD students who did not have computers or access to the internet at home, and spurred by a Genentech Foundation matching challenge, the SEI community raised nearly \$650,000 and provided the district with 7,000 digital devices, ensuring that all students were able to start the fall school year online.

CONCLUSION

The disruptions of 2020 provided optics into a persistent repertoire of transformation that defines the life sciences industry - especially, perhaps, in California. The convulsions of the last year have also compelled the industry to look more broadly at untapped talent pools for development - to create even greater access to the industry's vast and rewarding careers - and to add to the diversity of experience that fuels innovation. The industry's continued stability and growth in the face of these disruptions, regardless of magnitude, has sustained life sciences employers' critical focus on talent.

This report is intended to help multiple stakeholders stay abreast of the workforce needed to drive innovation and growth in the California life sciences industry, and to direct more attention to the partnerships and actions needed for development of the industry's full talent pipeline. As noted earlier, all of this will require dialogue between industry, academia, government and community-based partners - to address and anticipate the industry's evolving skill needs and to create opportunities to meet them head on to maintain California's standing as a global leader in life sciences innovation and economic development.



THANK YOU

To all the California life sciences companies and organizations that participated in the analysis, including the following companies that provided in-depth interviews.

AbbVie, Inc.

Amyris, Inc.

Ardelyx, Inc.

Audentes Therapeutics, now

Astellas Gene Therapies

Bayer AG Pharmaceuticals

Blade Therapeutics

Bristol-Myers Squibb

Boehringer Ingelheim

Caribou Biosciences

Codexis, Inc.

Edwards Life Sciences Corporation

Genome Medical

Horizon Therapeutics

Illumina, Inc.

Medtronic PLC

Merck and Company, Inc.

Nektar Therapeutics

Pendulum Therapeutics

Roche Diagnostics

Sutro Biopharma, Inc.

Theravance Biopharma, Inc.

Twist Bioscience Corporation

Vertex Pharmaceuticals, Inc.



Hiring Survey and Interviews

Proprietary data collection from life sciences companies occurred primarily through the use of two instruments developed for this report: the industry Hiring Survey and executive Interviews. Most questions focused on the recent past of January 2019 through December 2020, with special emphasis on the effects of the COVID-19 pandemic. Respondents also were asked to provide insight into workforce dynamics one year out from the response date. Additional details of each instrument are provided below:

Hiring Survey

The industry Hiring Survey was designed to capture data and contextual information on recent and anticipated hiring and related workforce dynamics including difficult-to-fill positions, impacts of the COVID-19 pandemic, workforce diversity initiatives, and other workforce issues. The survey instrument was designed for data collection by the Coalition of State Bioscience Institutes (CSBI)* leaders and academic and TEconomy partners who produced the CSBI TEconomy national workforce trends report. Biocom California Institute and the California Life Sciences (CLSI) Institute distributed the survey from late January through early March of 2021. A combination of phone and web-based surveys resulted in 334 response from California organizations.

Participating companies span industry sectors (Figure 2) and sizes, although representation is skewed toward three sectors:

- Research Testing & Medical Laboratories (34%)
- Drugs & Pharmaceuticals (23%)

and toward small companies:

- Very Small Companies: 58% from companies with 1-25 employees
- Small Companies: 13% from companies with 26-50 employees
- Medium Companies: 11% from companies with 51 – 150 employees
- Large Companies: 9% from companies with 151 – 500 employees
- Very Large Companies: 5% from companies with more than 500 employees

Interviews

The Interview process was designed to capture high-level perspectives from executives on the same broad set of issues addressed in the Hiring Survey. Interviews were conducted by Biocom California Institute and the CLS Institute from mid-January through late March of 2021. Responses were received from 23 California life sciences industry leaders.

Interviewed companies span industry sectors (Figure 2) and sizes, although representation is skewed toward the Drugs & Pharmaceuticals sector (65%) and toward large companies:

- Small Companies: 9% from companies with 10-50 employees
- Medium and Large Companies: 35% from companies with 51 – 500 employees;
- Very Large Companies: 57% from companies with more than 500 employees.

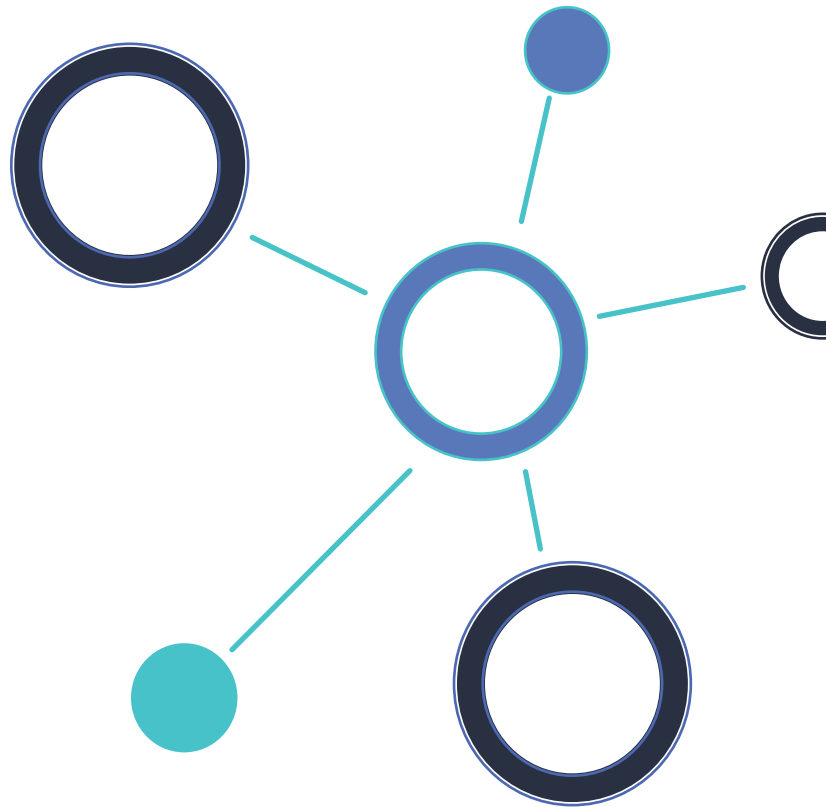
For both instruments, individual responses have been maintained as confidential. Details provided by interviewees and respondents were used to distill broader themes raised across the U.S. related to industry talent dynamics. Any specific quotations included in this report have been de-identified to protect the confidentiality promised to each respondent company.

APPENDIX A: METHODOLOGY

Job Postings

The third data set used in the report comprise the Job Posting analysis of Life Sciences Industry jobs (defined using NAICS codes, as detailed in Appendix B) advertised in California between January 2017 and December 2020 included 385,203 unique job postings in the Emsi, JPA Database, Q1 2021 <https://economicmodeling.com/>) as analyzed by TEconomy Partners.

*Note: CSBI represents the collaboration and coming together of 42 state bioscience organizations with a common goal and focus “to ensure America’s leadership in bioscience innovation by delivering industry-led life sciences education, workforce development, and entrepreneurship programs through a nationally coordinated effort.” The Coalition focuses on and promotes education and workforce training programs that the industry is uniquely positioned to deliver, are replicable and scalable across the nation, can be extended to other “STEM”-driven industries, and are aligned with K-12 standards: <https://www.csbioinstitutes.org/>.



APPENDIX B: DEFINING THE LIFE SCIENCES INDUSTRY

Life Sciences Industry Subsector	NAICS Code	NAICS Description
Agricultural Feedstock &	311221	Wet Corn Milling
	311224	Soybean and Other Oilseed Processing
	325193	Ethyl Alcohol Manufacturing
	325311	Nitrogenous Fertilizer Manufacturing
	325312	Phosphatic Fertilizer Manufacturing
	325314	Fertilizer (Mixing Only) Manufacturing
	325320	Pesticide and Other Agricultural Chemical Manufacturing
Drugs & Pharmaceuticals	325411	Medicinal and Botanical Manufacturing
	325412	Pharmaceutical Preparation Manufacturing
	325413	In-Vitro Diagnostic Substance Manufacturing
	325414	Biological Product (except Diagnostic) Manufacturing
Medical Devices & Equipment	334510	Electromedical and Electrotherapeutic Apparatus Manufacturing
	334516	Analytical Laboratory Instrument Manufacturing
	334517	Irradiation Apparatus Manufacturing
	339112	Surgical and Medical Instrument Manufacturing
	339113	Surgical Appliance and Supplies Manufacturing
	339114	Dental Equipment and Supplies Manufacturing

Life Sciences Industry Subsector	NAICS Code	NAICS Description
Research, Testing, & Medical Laboratories	541380*	Testing Laboratories
	541713*	Research and Development in Nanotechnology
	541714	Research and Development in Biotechnology (except
Nanobiotechnology	541715*	Research and Development in the Physical, Engineering, and Life Sciences (except Nanotechnology and Biotechnology)
	621511	Medical Laboratories
Bioscience-related Distribution	423450*	Medical, Dental, and Hospital Equipment and Supplies Merchant Wholesalers
	424210*	Drugs and Druggists' Sundries Merchant Wholesalers
	424910*	Farm Supplies Merchant Wholesalers

TEconomy Partners/BIO NAICS-based definition of the Life sciences Industry.

*Note: Includes only the portion of these industries engaged in relevant life sciences activities.

©TEconomy Partners' analysis of Bureau of Labor Statistics, QCEW data; enhanced file from IMPLAN.

APPENDIX C: CALIFORNIA REGIONAL HUB ANALYSIS

This Appendix provides deeper analysis of the unique workforce trends in each of California's major life sciences industry hubs by probing the Emsi, JPA Database, Q1 2021 for total life sciences industry job postings from the four-year period of January 2017 through December 2020.

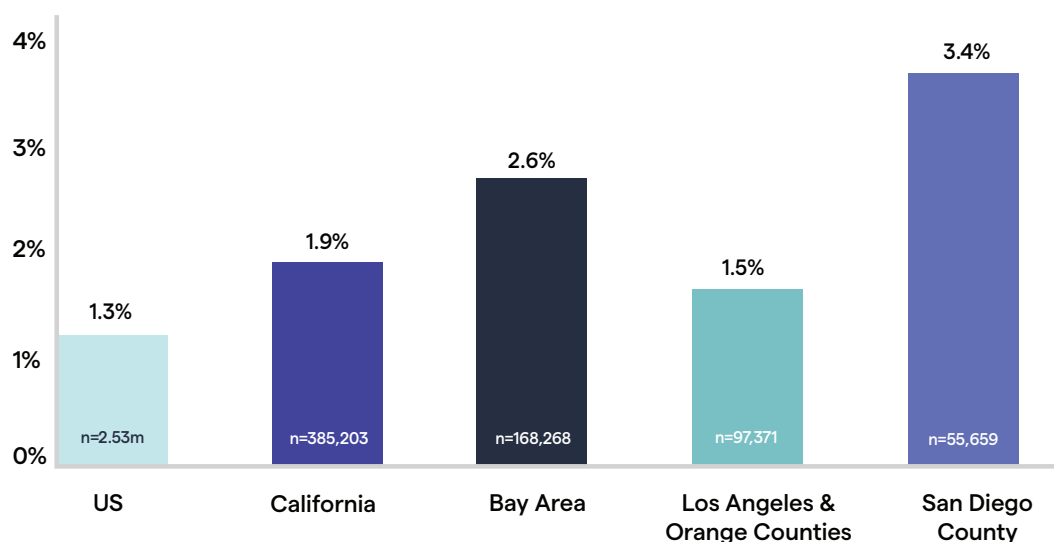
The nearly 3,800 life sciences companies in California are concentrated in three major geographic hubs:

1. The Bay Area, defined here as the region of 10 contingent Northern California counties of Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Santa Cruz, Solano, and Sonoma
2. Los Angeles and Orange Counties
3. San Diego County

For the period of 2017 – 2020, 86% of the total life sciences industry job posting for California were associated with these three geographic hubs. The Bay Area still dominates the state, with 44% of that total number of job postings (See Figure 6 and 7a in this report).

California's life sciences industry is a strong driver of economic growth and job creation in each of these geographic hubs, with life sciences industry job postings as a percentage of total job postings across industries in each region exceeding the national number.

Life Sciences Industry Share of Total Unique Job Postings by Region (2017-2020)

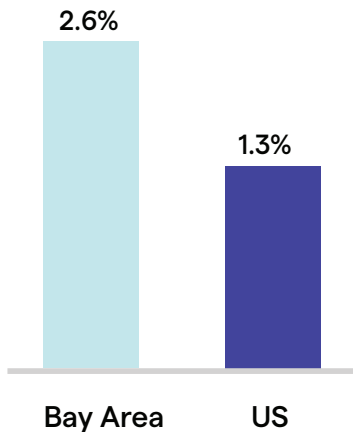


Source: Analysis of Emsi, JPA Database, Q1 2021.

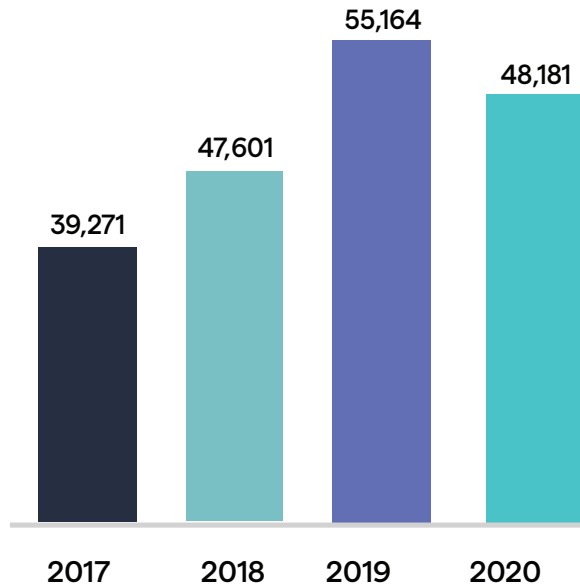
Life sciences industry job postings from the Bay Area outnumbered those from Los Angeles, Orange and San Diego County combined (e.g., for the 4-year period in the Bay Area, there were 168,268 postings. In 2020, the Bay Area's 48,181 life sciences industry job postings were nearly twice the number of the 25,691 postings from Los Angeles & Orange Counties, and nearly three times the number of the 17,078 San Diego County postings). Life sciences industry jobs, however, represent a greater proportion of the total number of job postings for any industry in San Diego County. In other words, while San Diego County contributed fewer new job postings than other regions across the state, life sciences job postings in San Diego County are relatively more important to the total local job market than in the other major life science regions of California.

THE BAY AREA HUB ANALYSIS

Life Sciences' Share Across All Industries of Total Unique Job Postings, 2017-20



Trend in Total Unique Job Postings from Bay Area Life Sciences Companies, 2017-20



Number of unique job postings from the period January 2017 - December 2020 for this region.

168,268
job postings

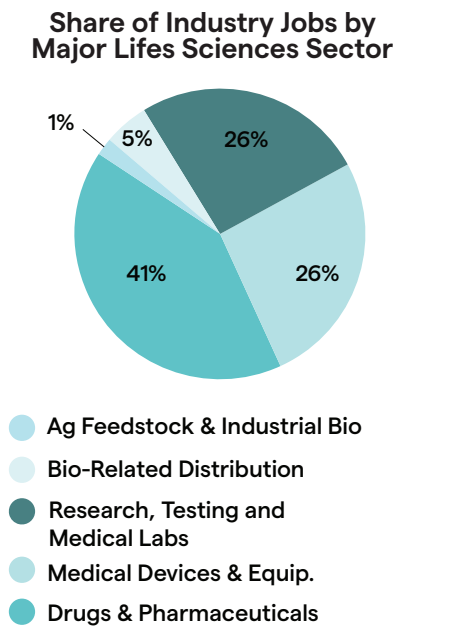
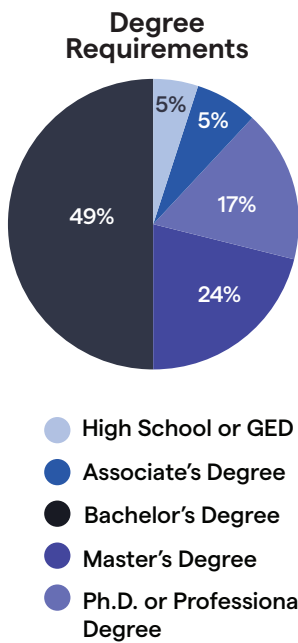
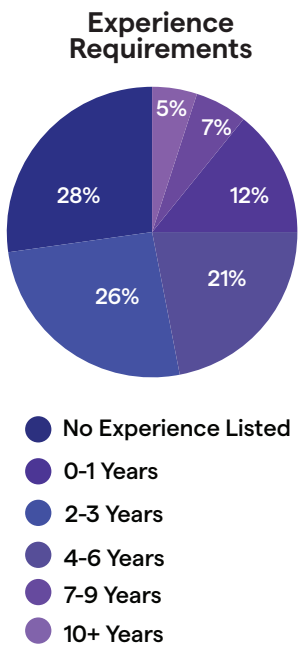
(44% of the total life sciences industry job postings for California)

Source: Emsi, JPA Database, Q1 2021

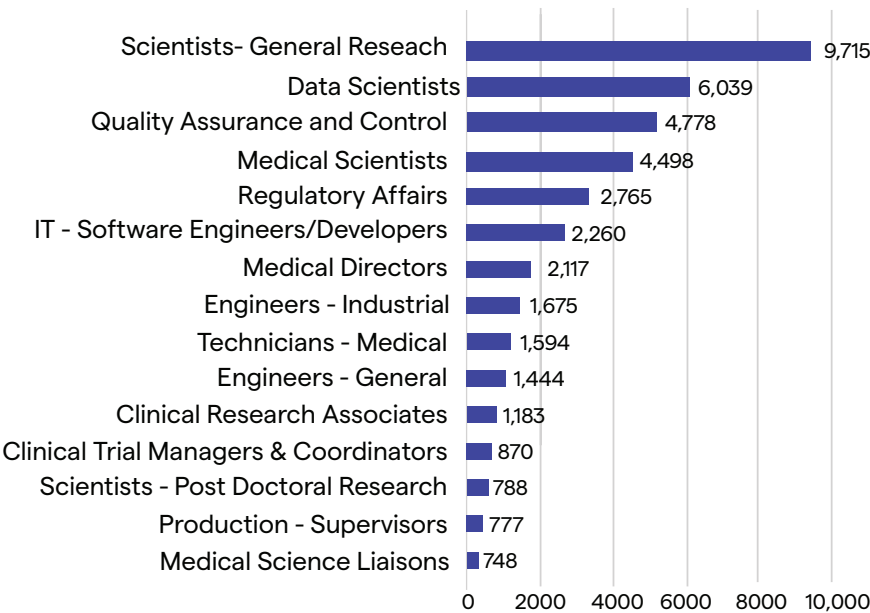
Top 15 Companies

Thermo Fisher Scientific, Inc.
Genentech
Roche Laboratories, Inc.
Gilead Sciences, Inc.
Abbott Laboratories
Danaher Corporation
Biomarin Pharmaceutical, Inc.
Bio-RAD Laboratories, Inc.
Medtronic, Inc.
Agilent Technologies, Inc.
Stryker Corporation
AbbVie, Inc.
Varian Medical Systems, Inc.
Jazz Pharmaceuticals PLC
IQVIA

THE BAY AREA HUB ANALYSIS (Cont.)



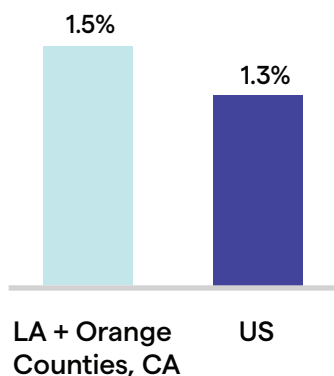
Bay Area, CA: Leading Technical & Production-Related Job Titles/Groupings for Life Sciences Hiring Over Last 4 Years



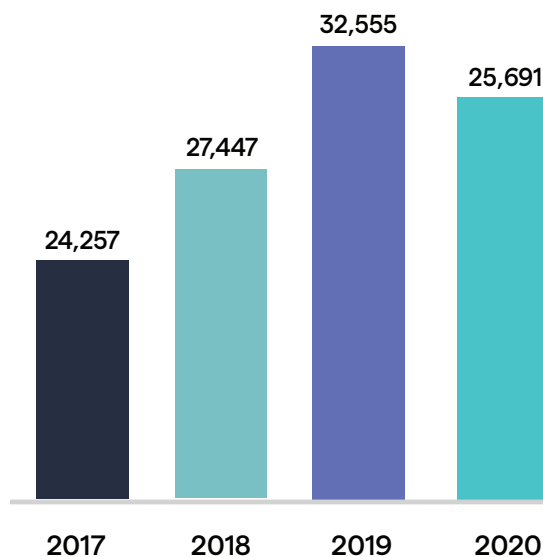
Leading job titles in technical and production roles in the life sciences job postings. Excludes large segments of the industry workforce in managerial, sales, and other business functions to focus on life sciences-specific positions.

LOS ANGELES AND ORANGE COUNTIES HUB ANALYSIS

Life Sciences' Share Across All Industries of Total Unique Job Postings, 2017-20



Trend in Total Unique Job Postings from Los Angeles and Orange County Life Sciences Companies, 2017-20



Number of unique job postings from the period January 2017 - December 2020 for this region.

97,371
job postings

(25% of the total life sciences industry job postings for California)

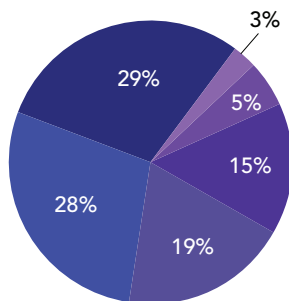
Source: Emsi, JPA Database, Q1 2021

Top 15 Companies

Edwards Lifesciences Corporation
Medtronic, Inc.
Quest Diagnostics Incorporated
Danaher Corporation
Johnson & Johnson
Abbot Laboratories
Thermo Fisher Scientific, Inc.
Allergan PLC
Kite Pharma, Inc.
IQVIA
Laboratory Corporation of America Holdings
Grifols Biologicals, Inc.
B. Braun Medical, Inc.
Masimo Corporation
Boston Scientific Corporation

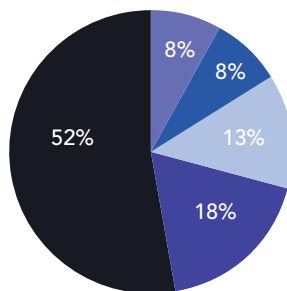
LOS ANGELES AND ORANGE COUNTIES HUB ANALYSIS (Cont.)

Experience Requirements



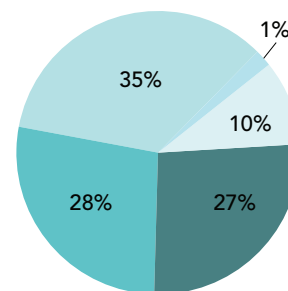
- No Experience Listed
- 0-1 Years
- 2-3 Years
- 4-6 Years
- 7-9 Years
- 10+ Years

Degree Requirements



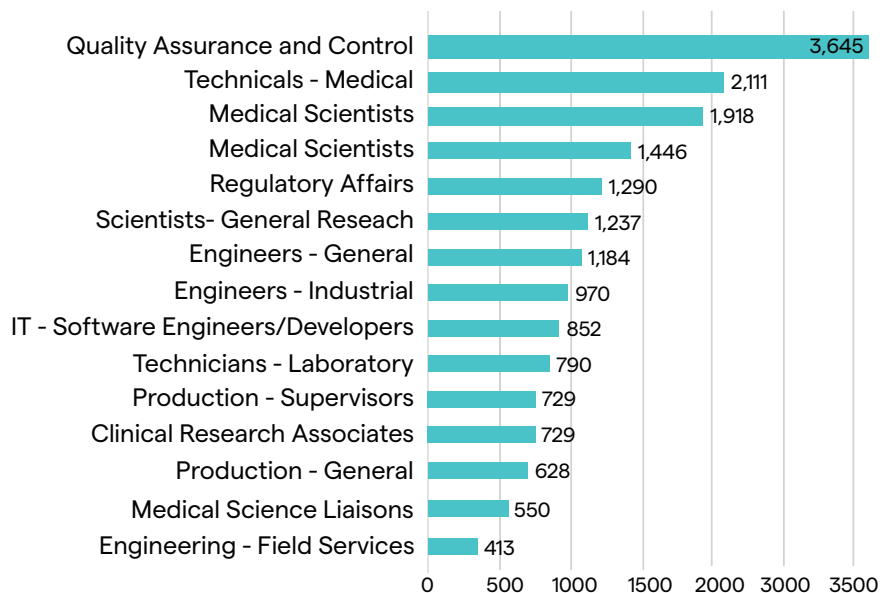
- High School or GED
- Associate's Degree
- Bachelor's Degree
- Master's Degree
- Ph.D. or Professional Degree

Share of Industry Jobs by Major Lifes Sciences Sector



- Ag Feedstock & Industrial Bio
- Bio-Related Distribution
- Research, Testing and Medical Labs
- Medical Devices & Equip.
- Drugs & Pharmaceuticals

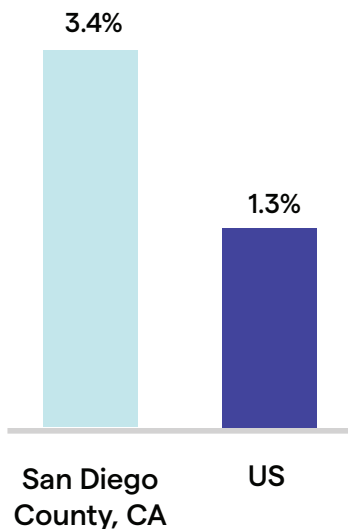
Bay Area, CA: Leading Technical & Production-Related Job Titles/Groupings for Life Sciences Hiring Over Last 4 Years



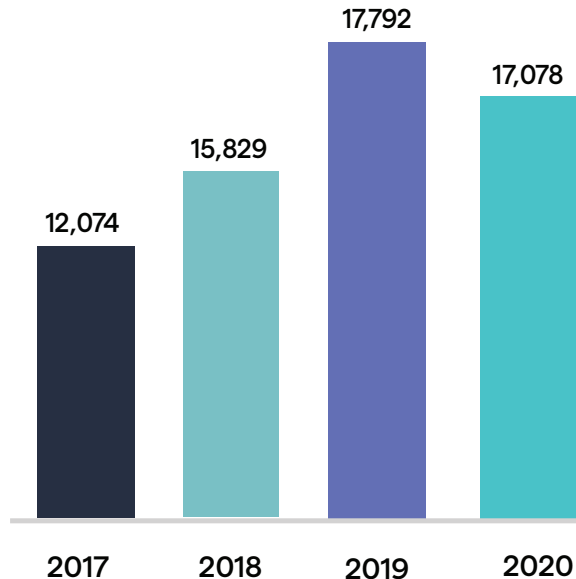
Leading job titles in technical and production roles in the life sciences job postings. Excludes large segments of the industry workforce in managerial, sales, and other business functions to focus on life sciences-specific positions.

SAN DIEGO COUNTY HUB ANALYSIS

Life Sciences' Share Across All Industries of Total Unique Job Postings, 2017-20



Trend in Total Unique Job Postings from San Diego County Life Sciences Companies, 2017-20



Number of unique job postings from the period January 2017 - December 2020 for this region.

55,659
job postings

(17% of the total life sciences industry job postings for California)

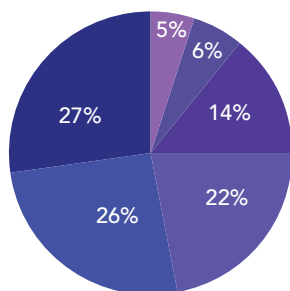
Source: Emsi, JPA Database, Q1 2021

Top 15 Companies

Thermo Fisher Scientific, Inc.
Illumina, Inc.
Pfizer, Inc.
Becton, Dickinson and Company
Laboratory Corporation of America Holdings
IQVIA
Danaher Corporation
Celgene Corporation
Neurocrine Biosciences, Inc.
Johnson & Johnson
Hologic, Inc.
Covance, Inc.
Abbott Laboratories
Quidel Corporation
Acadia Pharmaceuticals, Inc.

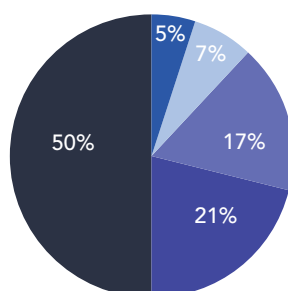
SAN DIEGO COUNTY HUB ANALYSIS (Cont.)

Experience Requirements



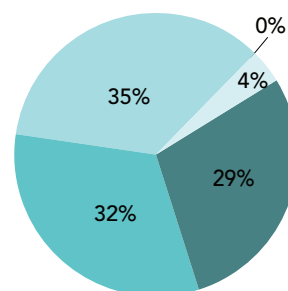
- No Experience Listed
- 0-1 Years
- 2-3 Years
- 4-6 Years
- 7-9 Years
- 10+ Years

Degree Requirements



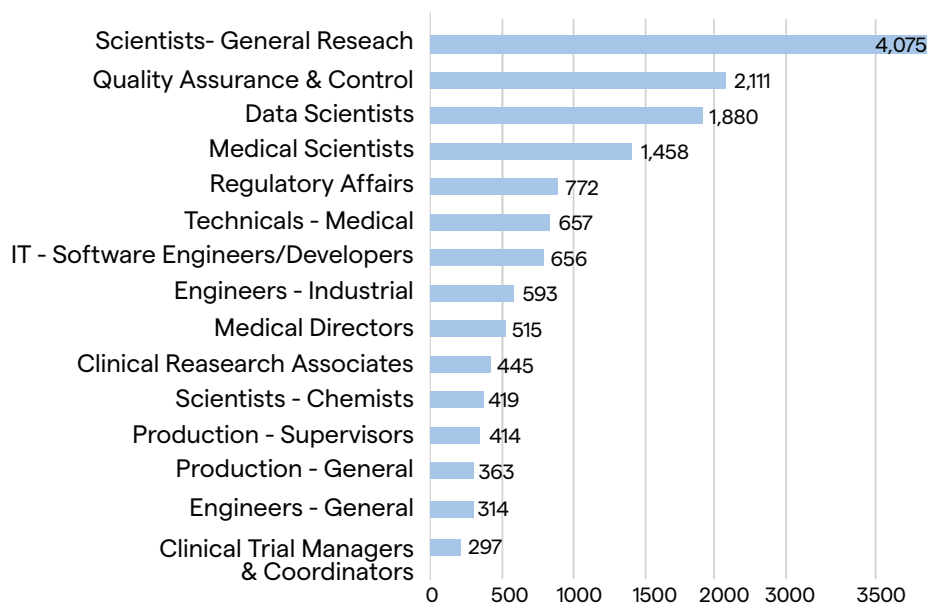
- High School or GED
- Associate's Degree
- Bachelor's Degree
- Master's Degree
- Ph.D. or Professional Degree

Share of Industry Jobs by Major Life Sciences Sector



- Ag Feedstock & Industrial Bio
- Bio-Related Distribution
- Research, Testing and Medical Labs
- Medical Devices & Equip.
- Drugs & Pharmaceuticals

Bay Area, CA: Leading Technical & Production-Related Job Titles/Groupings for Life Sciences Hiring Over Last 4 Years



Leading job titles in technical and production roles in the life sciences job postings. Excludes large segments of the industry workforce in managerial, sales, and other business functions to focus on life sciences-specific positions.

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Biocom California Institute

Biocom California Institute is a 501(c)® that accelerates the growth of California's life sciences ecosystem through innovative workforce development and life sciences education programs and strategies. We identify solutions to address employers' workforce needs, conduct research

and support the current and emerging life sciences workforce through professional development and outreach. With a goal to build a highly skilled and diverse talent pipeline and promote lifelong learning, Biocom California Institute supports life sciences innovation and success state-wide and in our local communities. Biocom California Institute is an affiliate of Biocom California, the largest and most experienced advocate for California's life sciences sector. For more information on Biocom California Institute, please visit our website at www.biocominstitute.org and connect with us on Twitter (@BiocomInstitute).

California Life Sciences



California Life Sciences (CLS) is the state's most influential and impactful life sciences membership organization, advocating for the sector and its diverse innovation pipeline. For more than 30 years, CLS has served the community by supporting companies of all sizes, from early-stage innovators and startups to established industry leaders in the

fields of biotechnology, pharmaceuticals, and medical technology. As integral components of a healthy and collaborative ecosystem, CLS also works closely with universities, academic and research institutions, the investment community, and other critical partners that promote this vibrant sector. With offices in South San Francisco, San Diego, Sacramento, Los Angeles, and Washington DC, CLS works to shape public policy, improve access to breakthrough technologies, educate lawmakers, and advance equity within our ecosystem by championing innovative solutions for some of the most pressing challenges of our times. In doing so, CLS fulfills its mission to protect and nurture California's life sciences industry, empowering discoveries that lead to healthier lives around the world. #WeAreCaliforniaLifeSciences www.califesciences.org @CALifesciences

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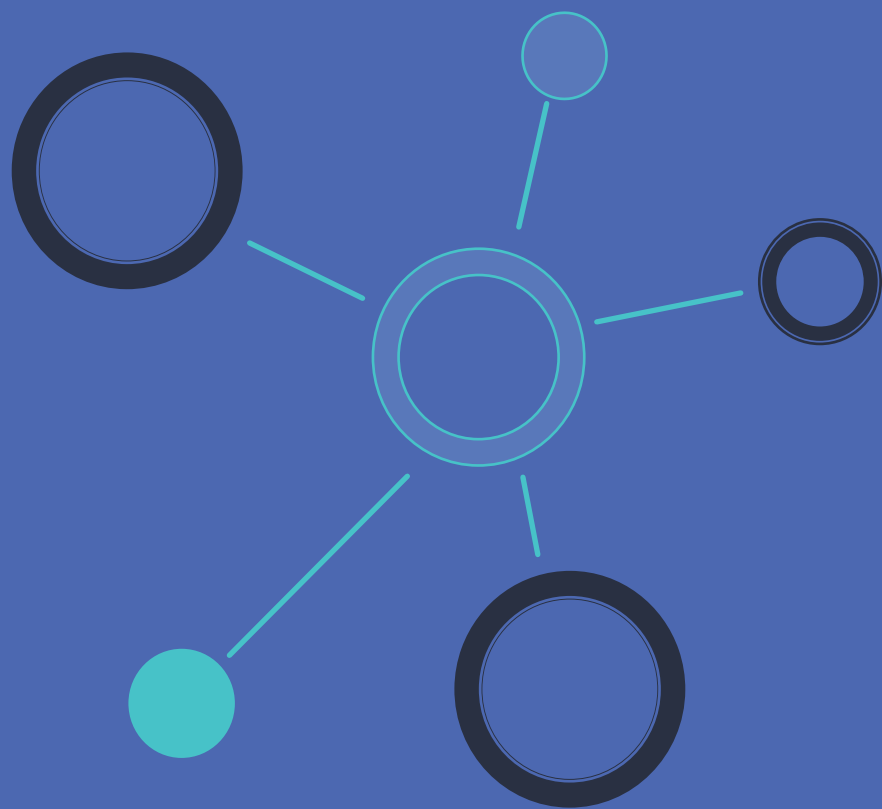


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